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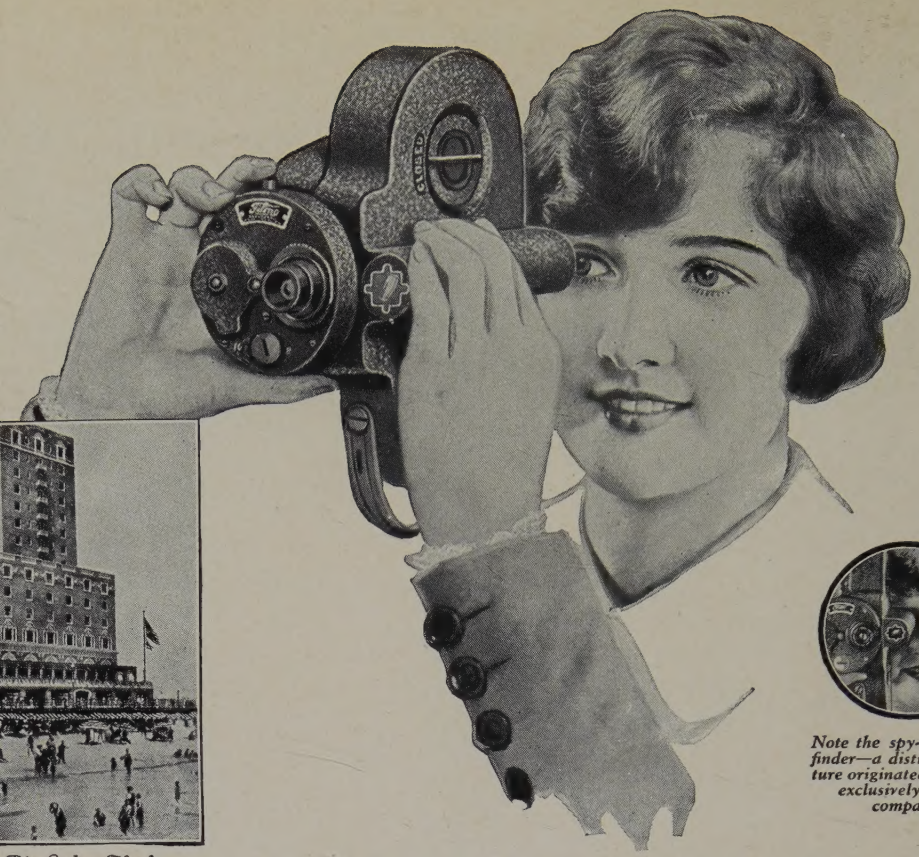

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Naturalist's Guide

Prepared by the Committee on the Preservation of Natural Conditions of the Ecological Society of America, with assistance from numerous organizations and individuals. Assembled and edited by Victor E. Shelford, assisted by a corps of specialists in various branches of science, 761 pages, 16 figures (maps). Williams & Wilkins Company, Baltimore, Md., February, 1926.

The keynote of this notable book is Conservation, the preservation in its natural state, for all rational purposes, of as much as possible of the rich biota of America. Our wealth of natural life has served well the springs of literary and artistic expression, and constitutes a laboratory for the study of many phases of science of inestimable value in both inspirational and material lines. Thoughtful minds view with distress the headlong wasting of our fauna and flora, sacrificed all too often to the demands of an ignorant and vulgar commercialism. Duty to ourselves and our descendants requires that we use every effort to pass on to posterity at least a portion of the priceless wealth that has been ours. The task is a hard one, but it is only by striving for a worthy ideal against great odds that man has risen from barbarism, and he has still far to travel.

With the conviction that the study of the relation of the organism to its natural environment is of supreme importance the present work was conceived. An effort has been made to take an inventory of our natural areas and to gain as clear an idea as may be of the extent of the changes which have already occurred, as a basis for further investigations.

Vegetation is the source of all life, and natural areas are therefore most clearly characterized and recognized by their plant covering. With this principle as a basis naturalists personally familiar with such areas, in whole or in part, were called on to describe their familiar fields. As a result a series of excellent essays of a character never before brought together has been assembled, the result of the gratuitous labors of a corps of students of natural science, including some of the ablest field naturalists in the world.

The work consists of six parts as follows: (1) A short introduction, setting forth the general purpose of the work. (2) A series of essays on the inspirational, recreational, and economic uses and values of America's natural areas. (3) Short articles on the correlation of different conceptions of areas. (4) Natural areas and regions. In this, the main part of the

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work, occupying about 630 pages, most of the countries, states, and provinces of America, grouped by natural areas, are described, topographically and faunally; routes of travel in the less settled areas are indicated, and lists of the more characteristic species of plants and animals are given, usually with a special treatment of species wholly or partially extirpated. (5) Lists of organizations interested in the preservation of natural areas. (6) List of North American birds, arranged by common names, and an index to authors and localities.

The book should be in the library of every person and organization genuinely and broadly interested in the preservation of our natural resources. To the explorer and traveler in remote regions, especially if he be interested in Nature, it cannot fail to be of help. It is a work notable alike in its concept and construction.—E. A. P.

Biology Book Revised

From the presses of Henry Holt and Company comes a revised edition of *Biology for Beginners* by Truman J. Moon. In his entire treatment the author has proceeded—and wisely—on the view that to be really effective an introductory book such as this should establish fundamentals. He has, therefore, not attempted to go into the many exceptions in Nature that lead into bypaths and confuse the elementary student. Complete collateral references take care of this detail in a considerable measure. The volume is well illustrated from a variety of sources, is rich in diagrammatic material, and is a distinctly valuable biology text.

Secrets of the Woods

The first appearance of the artist, Rex Brasher, in the capacity of a writer is in his *Secrets of the Friendly Woods,* published by the Century Company, which is a direct, intimate account of a few of his varied experiences in pursuit of knowledge of the out-of-doors. His special dream was to produce a complete work, in color, of the birds of our country. This necessitated much going about from place to place that he might know, at first hand, the habitat of his birds and be able to depict them truthfully. The pictures are made and now he is sharing with us some of the rich results obtained by the way. In the course of his studies of the feathered denizens of the woods, the meadows, the water-ways, he has come upon phases of their family and community life unknown to us. His chance to see a mother Woodcock carry her chick off in her foot was a piece of luck which comes to a favored few. I know of only one other who has had the good fortune to see it. One feels, as he reads, that there is a vast store of interesting material still in reserve and we hope that the author will soon let us into more of the "Secrets" which we are eager to hear.

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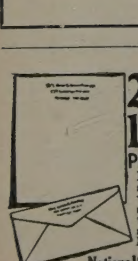

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Birds of Florida

If the Florida boom does nothing else, it will at least have served to bring about the publication of various volumes seriously and at the same time attractively presenting the facts of the flora and fauna of that state, which is rich in many things beside front footage at so much per. One of the particular riches is in bird life, both resident and migratory, giving full reasons for such a volume as *Birds of Florida,* by Harold H. Bailey.

This volume, which has been privately printed for the author by Williams & Wilkins of Baltimore, has seventy-six full-page color plates and 146 pages of text. The paintings are from the accomplished brush of George Miksch Sutton, state ornithologist of Pennsylvania. Were one to be particularly meticulous, one might say that the color printer had played a bit false in an instance here and there by over-emphasis on the blue plate. Possibly Mr. Sutton did not have an opportunity to study the color proofs before they were released.

Mr. Bailey has provided for each subject, of which there are in all 486, a brief statement in readable form. Now and then he has drawn upon his experience in preparing the "Birds of Virginia," apparently, and credited Florida with a few birds that are certainly not of occurrence in that state.

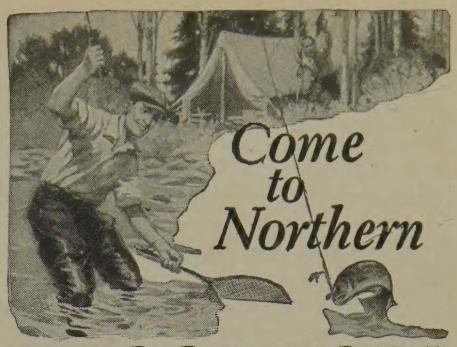
This combined work of Bailey and Sutton should be useful in identifying the birds found in the State of Florida. The sale price is $20, and it can be ordered from Mr. Bailey at the Professional Building in Miami.

Pathway to Reading

Not infrequently are we impressed with the thought that we wish we were a youngster again and going to school once more. With all due respect to the composers of our textbooks of past days, this thought arises most frequently when we look over school books of today. For example, *The Pathway to Reading,* from primer as far as the fifth grade, has just come to hand from the offices of Silver, Burdett and Company. Bessie Blackstone Coleman, Willis L. Uhl and James Fleming Hosic have jointly exercised a keen sense of sequence, balance and judgment in gathering the material for these books and providing the many textual hints and helps. The fundamental theory has been the selection of stories and articles covering many fields, emphasizing moral attributes, educating and entertaining at the same time. Nature subjects inevitably play an important part and the selections in this field are of marked wisdom.

Cornell Bulletins

Residents of New York State and teachers in other states will find several bulletins of distinct assistance on the List of Publications available from the Office of Publication at Cornell University, Ithaca, New York. The bulletins cover country life,



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Beautiful Berkshire

In these days of a touring nation there are myriad guide books, directions, publicity pamphlets and beautifully finished brochures. They seek to lure vacationists and travelers, and they do. But here is a different guide book. It is called *Beautiful Berkshire*. Whoever has been over the Mohawk Trail—and he who hasn't should remedy this lack at the earliest possible moment—knows that the adjective is but scant praise of these wonderful mountains of western Massachusetts. The Lenox Garden Club of Lenox, Massachusetts, knows this, also, hence this 60-page pamphlet, which is an illustrated guide to the beauties and interests of the Berkshires. But more than that it is a really constructive pamphlet. On one page is a reproduction of one of Ding's cartoons of a family of autoists frantically tearing up all the flowers they can find in a farm along the roadside. Opposite are pictures of a few of the Berkshire wild flowers that the visitor is requested to leave for others to enjoy and because to pick them is to endanger their future. Another page is devoted to forest fire prevention; one to the sloven aftermath of a thoughtless picnic party; and others to reproduction of cartoons of roadside despoliation by signboards. It is a mighty fine piece of work as well as a serviceable guide book, and anyone who wants one can get one by writing to Miss M. Parsons, Stonover, Lenox, Massachusetts.

Nature Lore School

Dr. William G. Vinal of the New York State College of Forestry announces the opening of the seventh annual session of the Nature Lore School at Camp Chequesset, Welfleet, Mass. It will take place the week of June 24 to June 30, and any information as to the session can be obtained from the offices of the American Nature Association or from Dr. Vinal at Syracuse

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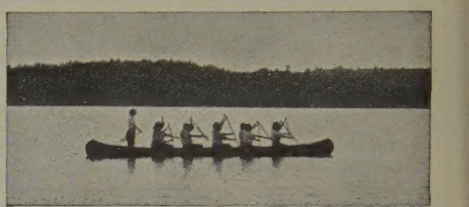

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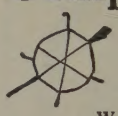

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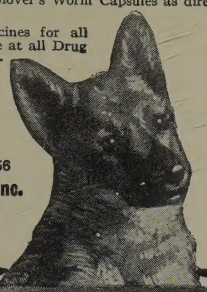

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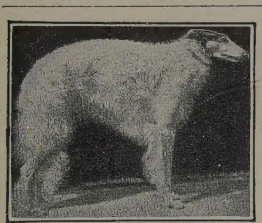

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SUBSCRIBING MEMBERSHIP BLANK WILL BE FOUND IN THE BACK PAGES OF THE MAGAZINE

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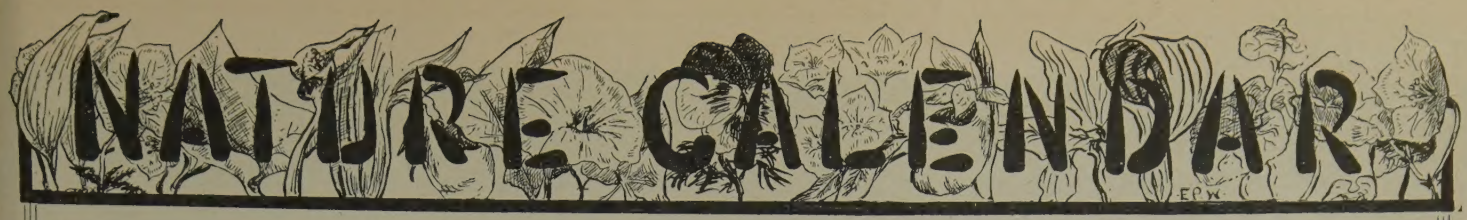

JUNE

"And near to the river's trembling edge
There grew broad flagflowers, purple prank't with white;
And starry river buds among the sedge;
And floating water lilies, broad and bright,
Which lit the oak that overhung the hedge
With moonlight beams of their own watery light;
And bulrushes, and reeds of such deep green
As soothed the dazzled eye with sober sheen."

—SHELLEY.

This is water lily time when ponds and quiet streams are a constant delight.

Margins of ponds and rivers are now literally alive with young toads. With the disappearance of their tails they become terrestrial hoppers.

The painted cup, now covering the meadows with flaming red, has been most appropriately described as "the brightest dab of red the wild palette can show." The color is furnished by its leaves in disguise; the flowers being greenish and inconspicuous.

Cuckoos are feasting on tent caterpillars. About half of this bird's diet consists of these hairy crawlers.

The locust tree is fragrant with long drooping clusters of flowers.

The swelling amphibian choruses of last month have dwindled to weak, occasional serenades. The deep bass of the bullfrog, however, is a recent addition to the sounds of the ponds and lakes.

Fringed milkwort or flowering wintergreen bears dainty magenta flowers for all to see, but deep beneath the soil it hides another kind of blossom. "Cleistogamous subterranean flowers" these are called.

At night fall the leaves of the wood sorrel droop and fold in an attitude of sleep.

Collectors of polyphemus cocoons often receive surprises as they watch the inhabitants of these silken houses escape. Instead of beautiful moths, ichneumon flies, parasites on the polyphemus, may come forth.

Baby deer are born in June. These the mother deer conceals in a thicket while she browses nearby.

It is mating time for blackbears.

The noisy broods of early-nesting crows are now on the wing.

By this time baby chipmunks begin to venture out of their homes into the sunlight.

Along rocky ledges in the glen, columbine is in bloom.

This is spawning time for catfish. As many as two thousand eggs may be laid in one nest.

Such strategic devices as smoke screens have been in use by beetles even before man invented wars. Under some stone you may find bombardier beetles which, upon being disturbed, will demonstrate with several volleys of white, pungent, smoke-like vapor.

Blackberry vines are showering their white petals on the ground.

Young beavers are beginning to try out the gnawing abilities of their teeth. You may find them following their mother about.

Do you know what hidden treasure is in your morning glory vine or that bind-weed nearby? A tiny lustrous beetle of burnished gold (Cassida aurichalcea) feeds upon these plants.

Woods and fields everywhere resound with the songs of birds. This also is nesting time for them.

The black swallow-tail butterfly, so frequently seen fluttering about clover blossons, invariably selects one kind of food plant for its young. It deposits its eggs only on plants of the parsley family.

The wind is scattering the seeds of the red birch on the ground beside the pond or river.

Goldfinches and waxwings defer home-keeping operations until next month. They now may be seen wandering about the country.

Mushroom fanciers may now find the much-prized morsels growing in damp woodsy places.

Snapping turtles are laying their eggs near the ponds and streams.

Many robins and bluebirds are now occupied with raising their second broods.

Three meteoric showers are due in June; one slow bright shower about the 7th near the Crown; another near Ras Alhague about the 10th and a third swift shower from Cassiopeiae about the 20th of the month.

Prepared for NATURE MAGAZINE by the Cleveland Museum of Natural History

HIS SLOGAN IS "MADE IN AMERICA"

PHOTOGRAPH H. ARMSTRONG ROBERTS

He took some time to arrive but he has made good and to America alone is the credit.

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NATURE MAGAZINE

Vol. VII JUNE, 1926 No. 6

Buy a pup and your money will buy
Love unflinching that cannot lie—
Perfect passion and worship fed
By a kick in the ribs or a pat on the head.
—RUDYARD KIPLING.

THE BOSTON TERRIER—MADE IN AMERICA

By ALBERT PAYSON TERHUNE

HIS SLOGAN is "Made in America!" He is the one dog, it is said, to merit the title, "American-Made." Years and planning and many grievous setbacks went into his making, before he stood at last before an admiring world, as the Boston terrier. He took some time to arrive. But he has made good. And to America alone is the credit. No other country can claim any share in his development.

Like the Airedale and the Doberman and one or two other popular breeds, the Boston did not exist in his present form, a few decades ago. He was produced by a wise blend of other breeds. But this blending was done in America; and it was done with a wisdom and a knowledge of anatomy and of ideal temper and temperament that resulted in a dog worthy the "Made in America" trademark.

The Boston's chief—perhaps only—ancestors were the English bulldog and the English terrier. The Boston is far smaller than either of them. He combines most of the desirable traits and physical points of both these breeds.

The bulldog traces his ancestry far back into Roman days, if not beyond. He was built for fighting, and he was developed and used for fighting. He got his name of bulldog because of his prowess in tackling bulls, in the long-popular sport of bullbaiting. This was the national pastime of which Macauley says the Puritans disapproved; not because it hurt the bull, but "because it gave pleasure to the spectators."

To grip the bull, and to hang on, at the same time being able to breathe, the bulldog was bred with an undershot jaw and back-flaring nostrils. For like reason, he had a stocky and intensely muscular body and widespread legs to grip the ground. In modern times, when these phases are no longer put to practical use, fashion has intensified them almost to the point of grotesqueness.

The English terrier was, as his name implies, a dog adapted to dig in the ground, to fight badger and fox and otter, in their lairs beneath the earth. As I said in my "Scotty" article, the word "terrier" is

PHOTOGRAPH INTERNATIONAL

A BASKETFUL OF BULL PUPS

These, however, are English bull pups, cousins of the Boston terrier whose ancestry includes the English bulldog.

derived from the Latin "terra" and the resultant French word "terre," both meaning "earth."

These, then, were the two principal ancestors of the present-day Boston. He has a little in common with both of them, and not too much with either. When the cross was first made, the new terrier was, of course, much like both his parents. He was a willing and eager fighter. Indeed, his fighting instincts were developed more than were any others, except, perhaps, his brain-power.

At first, too, one of the new breed's popular names was "Bull and Terrier." But this did not fit, and as time went on it was made to fit still less. His ancestors, says Little, "were brought over here by seamen on English ships, where they were much esteemed as ratters."

One of these earliest dogs was a blazed-faced dark brindle, screw-tailed and long of leg. He weighed about thirty-two pounds and he was named "Judge." He is as coveted an asset in the Boston's family tree as is a Mayflower ancestor among humans.

Another of the ratters brought over by English sailors was a white female, with a three-quarter tail and a weight of twenty pounds; and much more resembling a bulldog than a terrier. Her name was "Gyp."

This pair were mated. They were the Adam and Eve of the Boston terrier race. From them, and from their carefully selected and interbred descendants, was created the Boston terrier. For a long time, the world at large refused to be interested in him. But a few devotees had faith in the new breed and kept on developing and improving it. Year after year they continued, in the face of discouragement.

"HOW ABOUT LETTING ME IN?" PHOTOGRAPH MARGARET PROVOST

The Boston Terrier has a way of letting himself into one's heart, there to stay forever.

At last, in 1891, these devotees formed in Boston an association they planned to call "The American Bull Terrier Club of Boston." Then came another setback. When they sought to register their new breed as "bull terriers," they were informed the dog was not a true bull terrier. It was a distinct breed, to be sure, but it did not fill the accepted definition of "bull terrier."

The association looked for some more descriptive name whereby to register their newly evolved pet. A member suggested they call it a "Boston Terrier." The suggestion was approved. The dog became officially "the Boston Terrier." The association became the Boston Terrier Club. The breed at last received recognition from the authorities in 1893. The Boston had arrived. He had come to stay.

But the breeders' troubles were not yet over. Most evolved breeds settle down quickly into one standard mould, with few exceptions in the way of freaks or of "throwbacks." The Boston refused to do

AND THIS IS LADY GRAND PHOTOGRAPH INTERNATIONAL

An aristocrat of Boston Terrierdom, this lady is a prize-winner. She did not like the looks of the photographer.

so. For one thing, he refused to reproduce himself in one size and weight.

Accordingly, in judging Bostons, it became necessary to divide the classes by weights. Some conformed to the desired weight. Some were far above it. Thus the various weight classes, etc. Nor was this the only throwback to the two different parent strains. Says Mott:

SHALL IT BE DISCRETION?

A serious decision is facing this terrier because a display of valor may be rewarded with scratches.

"He continues to present himself as representing several distinct types; so that we often have an example of the English bull and of the true type of Boston terrier and of a pronounced *terrier,* in the same litter, despite the utmost care in breeding."

Luckily, these digressions have grown few and fewer, under wise care. The true type Boston is overwhelmingly in the majority; and a beautiful and first-rate all-round dog he is; compact, finely moulded, alert, showy—an ideal city chum or country walk-companion.

Indeed, he is one of the very best non-toy dogs to own in a city apartment. To keep a big dog in such quarters is like cooping a hawk in a canary cage. A big dog is as bad for a big city as is a big city for a big dog. Also, some people do not care for so-called "toys," but want all dog.

Such people cannot do much better than to buy a Boston. He is "all dog," despite his smallness. He has brain and looks and style and loyalty and a sense of fun. Best of all, he is, as I said, "American Made,"—an excellent trade-mark.

The White-tailed Deer Has Twin Babies

WHEN the mother deer has to seek food and drink, or when she is warned in time of the approach of an enemy, she hides her babies in some thicket where she thinks they will be safe. They then lie flat on the ground with outstretched necks, and often the brown ground color with white spotting merges so cunningly with the sun-flecked forest floor that it takes a sharp eye to detect them in their leafy bed.

These youngsters, however, have been roused from their hiding-place, and with their bright eyes, alert ears, and their long ungainly-looking legs, they are conspicuous enough. Let us hope that no enemy will come along while they are unprotected. At the tiniest bleat of distress the mother flies to their aid, and unless the odds are too great she will rout the foe in short order.

When the fawns are about a month old they begin to follow their mother about in her short journeys and soon become very swift of foot. Soon they begin to graze and from that time are able to take care of themselves. But long after the mother weans them from their diet of milk, and they have exchanged their spotted baby coats for a grayish-brown dress like hers, she still watches over them.

PHOTOGRAPH BY UNDERWOOD AND UNDERWOOD

TWIN FAWNS OF WHITE-TAILED DEER

These dappled youngsters, not many days old, have been hidden by their mother while she makes a little trip for food and water.

Deer feed mainly in the half light before sunrise and after sundown, and on moonlight nights. In settled communities they love the farmer's garden, and when through protection they become abundant and tame, it is sometimes difficult for him to harvest a fair share of some of his more tender and succulent crops, especially if his fields lie near the forest, and at a little distance from the house-dog's familiar beat.

DINING ON A SQUARE MEAL OF BERRIES

The mother Phainopepla fed her babies by regurgitation, carrying enough berries for a feeding at one time.

AGUA CALIENTE

By W. L. & Irene Finley

(ILLUSTRATIONS BY THE AUTHORS)

ALL FOUND BY THE GENTLE WATERS

(Above) A young Vermilion Flycatcher, and to the right, eggs like the one from which it came. To the left, the eggs of a Phainopepla. (Below) Mother Phainopepla studies a serious problem in dietetics.

IT WAS a rough sign nailed to a sahuaro, or giant cactus, with a finger that pointed down a smooth road curving in and out among the cactus, creosote and mesquite. Even with our limited knowledge of Mexican, we knew that the first word meant water, and we had known from previous experience that in the semi-desert around Tucson this ought to draw birds like a magic charm. To be sure, the water would be warm where the sun is so persistent.

Whirling along an auto trail in the desert, grazing the branches of the dangerous cholla cactus and thorny mesquite, we swept down across one sandy wash and then another and almost without warning drew up beside a small pond. On the right was a thick bramble of mesquite trees loaded with bunches of mistletoe the size of small haycocks, a leafless species, each bunch painted pink with numberless round berries. Out from the center of the bramble flowed a little stream of clear water in which schools of tiny fish flashed. Two frogs jumped headlong from the bank. The birds that flitted in and out were twittering and singing in the joy of finding this little Garden of Eden in the Arizona desert.

Suddenly a pure black bird with a white blotch on each wing shot up

like a rocket from the thorn thicket, airplaned above us a moment, and then in pure love of adventure nose-dived and hurtled downward, revelling in the narrow margin of being impaled on the thorns. It was a male phainopepla, gayly dressed like an Indian on the warpath with the slender black feathers of his bonnet standing stiffly erect. His crest was like that of a cedar waxwing, but his long tail and trim body gave him the very poetry of motion above his realm of thorns.

Just then another male appeared above the mesquites and our black prince darted out, a veritable D'Artagnan in conflict. Pursuer and pursued dove and circled till at times it seemed as if they would strike in mid-air; finally they rose higher and higher until both birds were but tiny specks and the intruder was driven away. Our bird tobogganed like a black meteor in a long glide until he was straight above his home when, with a twist of his wings, he shot earthward as if playing with death and brought up on the limb beside his mate as lightly as the touch of floating thistledown. His gray-cloaked wife viewed the whole performance with feminine unconcern. Straightway he was off again, but this time in search of building material. In two minutes he returned, slipped into the bunch of mistletoe, and twisted around and around as he molded a new grass nest. What a home site with a tangle of branches loaded with a food supply of berries. His mate followed and watched while he talked in a queer, clicking language that sounded like the snapping of his beak. Again and again he brought a variety of fittings and fillings and worked them carefully while his wife looked on in approval, but made no effort to help. It was a fair arrangement. Between times he stopped to warble notes as alluring as the male mocking bird that lived on the other side of the thicket.

The dashing black phainopepla is an attentive lover and father. He builds the nest, helps to keep the eggs warm and assists in hunting dinner for his bantlings. After the hunt he drops to the edge of the nest empty-handed as it were, yet still he carries a full dinner pail. As if by magic a red berry appears in his bill and he drops it into a hungry mouth. Another and another appear, and it is only by looking very closely that one can see he is regurgitating the feast for his nestlings. Just the slightest swelling of his throat as berry after berry appeases the hunger of the youngsters.

ABOUT TO BREAK THE HOME TIES

Young Phainopepla considers the question of leaving the nest and trying out its wings.

Living near the phainopepla were other birds attracted to the thicket bordering Agua Caliente. It would be difficult to imagine a more ideal spot for birds in this arid stretch of Arizona that sloped off from the foot of the rugged and fantastically shadowed Catalinas, than this garden oasis.

The real spirit of the mesquite thicket was embodied in a gaily dressed troupe of cardinals that flamed in and out of the darker underbrush. One bright Arizona cardinal slipped out of the shadow of a palo verde and dipped into the shallow water for a bath. His large bill and black face were strikingly set off by a crest and cloak of crimson. His cousin, the gray cardinal or pyrrhuloxia, gave a contrasting touch of color. His high headdress was dark red at the top and the color seemed to have dripped from his crest down over his throat making a vest-coat of rosy red. His thick yellow bill gave him the facial expression of a parrot, an illusion which surely had no reference to his voice, for he was a real feathered artist of the flute and a striking contrast to the gray and white mockingbird with his varied and brilliant repertoire.

THE PYRRHULOXIA SITS ON ITS NEST

This bird is a cousin of the eastern Cardinal or Red Bird but is more gray in color scheme.

Just beyond the thicket on the border of the pond grew an old cottonwood. On the end of one of the dead limbs flamed a spot of red as conspicuous as a tiny beacon light. Suddenly it came to life and swept out low over the pond; a bill snapped sharply, and the vermilion flycatcher returned to his perch. This little flame of scarlet looked as if he had strolled up from the tropics and was almost out of place. His wings and back were dark brown. His cap, which raised and lowered with his varying moods, and his breast were of a fiery hue. A little beyond another flycatcher of the same size, engaged in snapping insects, was of very different plumage—the brownish gray coat faded to a soft yellow below, a marked contrast to the other bird of flaming colors. Were these birds akin? The bird of gray dropped to the ground and gathered up a straw. Away she went to the limb of a hackberry tree to weave it into the walls of a half-built home. Instantly came the answer to the question. She was joined by the dapper-dressed gentleman. They were mates. Mother Nature was so lavish with her paints in one, and so miserly with her colors in the other.

The flashes of brilliant color and the roundelays that rang through the brambles and across the pond were but a part of the bird life around Agua Caliente. A little bridled titmouse bobbed down for a bath, a pair of verdins—little cousins of the bush-tits—hunted quietly for green measuring worms, and a plumbeous gnatcatcher sounded his querulous hunting song. Perhaps the strangest sight was a great blue heron that came to wet his feet and perchance spear a few minnows and frogs about the margin of the pond. He was almost as much out of place as the pond itself that came out of the desert and like a magnet had drawn this long-legged wader of the marsh and shore far from his natural home.

COLOR PICTURES

Readers of NATURE MAGAZINE have not found a full-page color insert with this issue. This is because of the change in policy announced in the May issue. Beginning with July, and from then on every other month, there will be twelve color subjects bound into the magazine, thus insuring them against loss and damage. We may safely assure our readers that they rank with the most beautiful products of R. Bruce Horsfall's facile brush, but we will keep the subjects a secret until next month.

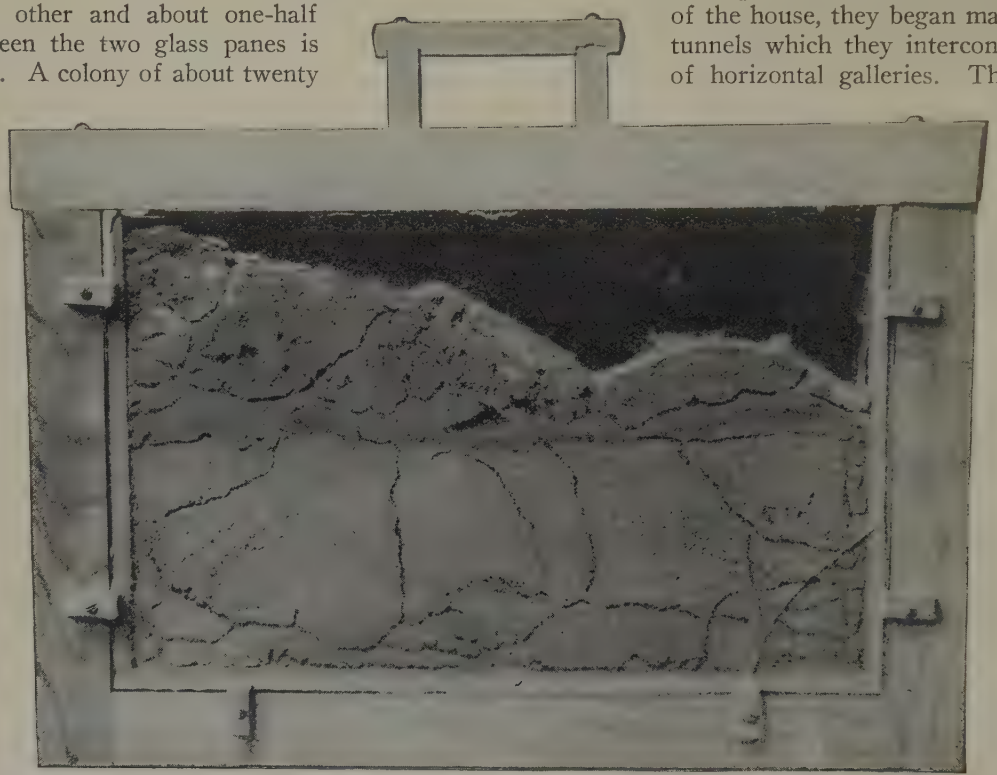
Here is a suggestion for the schoolroom, for the summer camp's Nature museum and for Nature students, individually and collectively. Such a simple means as Professor Austin suggests in this story of the intimate family life of the industrious ant may be used by many for a similar study.

An Intimate Glimpse of an Ant Colony

By F. E. Austin

DID YOU ever dig down into an ant hill to find out how the rooms and the hallways were arranged inside? If you haven't engaged in such active investigation, you may have allowed yourself the milder recreation of only wondering how ants' homes are arranged inside. Here is one way to find the facts.

The ant house pictured here consists of a framework of wood so arranged as to hold two panes of glass parallel with each other and about one-half inch apart. Between the two glass panes is fine sand and loam. A colony of about twenty ordinary small brown ant workers, a queen and a few young ants, became the tenants of this house. The workers immediately began to excavate a small tunnel, which they enlarged into a queen chamber or a general assembly hall that may be seen at the right center of the picture. At first the ants worked with feverish haste to make the queen chamber, toiling day and night. Even the queen now and then carried out sand particles too large and heavy for the ordinary workers to transport.



THE SECRETS OF ANT LIFE ARE BARED

A home of simple frame with two faces of glass, some sand and loam and some ants, provide much entertainment and instruction.

Once her apartment was finished, the queen ceased such menial labor. As you may know, the queen ant is always several sizes larger than the ordinary ants of her family, and the queen of this particular colony is herself as large as the common black-ant worker.

After the ants had made the queen chamber of fair size they began excavating tunnels leading away from it so that it had several exits. The workers next separated into two parties, one of which excavated a tunnel to one end of the house while the other excavated another tunnel to the other end of the house. Each party continued tunneling down each end and along the base of the house until the tunnels met at about the center of the base.

As the writer had failed to inform the ants they would be kept at a comfortable temperature all winter, they were doubtless aiming to get below the frost line with some of their compartments. However, after the ants had tunneled as deep as they could because of the woodwork of the house, they began making other vertical tunnels which they interconnected by a series of horizontal galleries. They made some of the long, vertical tunnels upward from the lower, horizontal tunnel, instead of what human engineers might deem to be an easier method, from above downward. It is also interesting that the ants excavate a small preliminary or exploring tunnel first and enlarge it as desired later on.

It has been observed that at a temperature as low as forty degrees the ants cease work and assemble in a group close to the queen in the commons or queen chamber. If the house is moved from the cold to an open fire or other source of heat so that the house temperature rises to around seventy degrees, the ants will all begin to move about and start in working.

Ant homes have as great architectural variety as do human habitations, yet with the same fundamental plan. There are a number of surface exits to prevent complete stoppage by accident, and the various connecting tunnels insure good ventilation of the underground abode. The ants appear to be working constantly for the welfare and for the continuation of the race, but as individuals they are self-reliant.

The Story of the Clouds

By Gayle Pickwell

EVERYONE has an inborn interest in clouds! The naturalist never outgrows that native interest. It's like a birth-mark, remaining with one through life. To the mariner, the artist, the amateur weather prophet, the picnicker, the chainless motorist and umbrella-less business man clouds are matters of weighty moment. To the naturalist they are more than to any of these. Clouds may disappoint the farmer, dampen the picnicker, cause the motorist to skid and obscure the finest eclipse, and yet be, to the naturalist and Nature lover, a never-ending delight.

I have yet to find one so blasé that he could not find beauty in clouds. The glory of a sunset, the majesty of a thunderhead, the brilliance of a summer day owe part, or all, of their beauty or majesty or brilliance to clouds. There is art and more—there is beauty—in clouds.

There are many who occasionally look up at the everchanging sky with something of amazement at the events transpiring there. Perhaps the phenomenon of clouds, the mighty problems involved, have impressed everyone at least once. Clouds are problems, many of them yet unsolved.

What is a cloud? The old geographies say it is a body of minute water particles suspended in air. It may be suspended near the earth's surface in fog, or float, as the lofty cirrus, many miles above the level of the land. Clouds may form in the low pressure of a storm area, may form when air is cooled in lifting over a mountain or in passing on to a cold body of water, as happens off the coast of Newfoundland when the southern air strikes the Arctic current. The thunderheads and other clouds of a warm summer day are formed by the rising and cooling of the warm surface air. The methods of cloud formation are numerous, but this secret contains the key to them all: Whenever moisture-laden air is cooled below its capacity for the amount of water contained, then clouds form.

PHOTOGRAPH J. E. MC HUGH

A MAKE-BELIEVE TORNADO

Heavy fracto-nimbus clouds rolled into long and ominous streamers by the wind.

Clouds are classified according to their general appearance, height and method of formation. There are four general types and several variations and combinations of these which give thirteen names in all. Each name, interpreted from the Latin, gives the most striking characteristic of the type.

Cirrus means a "lock of hair." That is the impression the clouds often give. They may be curling fibers, long, slender filaments or streamers of tresses. They may also be branched or rippled or waved, and often the cirrus cloud —the "lock of hair"—looks very much as if it had been marcelled! Occasionally the cirrus may appear as a formless haze.

Cirrus clouds are always high, never dense, and are whitish in appearance. Because of their extreme height they are usually composed of ice crystals rather than liquid particles. These clouds ride the skies at an average altitude of five miles. They may, at times, ascend to nine or ten, but they never drop much below two miles from the earth's surface.

A low atmospheric pressure such

as occurs in a general storm area, or atmospheric waves, will cause cirrus clouds. Usually the approach of a general storm will be heralded by the advent of the high-flying cirrus. They precede the storm by many hours as a rule. An old mariner will call them "Cat's Whiskers" or "Mare's Tail," and he will make preparations for heavy seas at their appearance.

The most beautiful cirrus, however, are those of spring which follow a stormy April week. The northwest wind then ripples the lofty down into many fantastic shapes.

A stratus is a "layer," and the layer cloud is flat, even, and overcasts the sky in all directions. It is the cloud which dampens the enthusiasm and chills the spirit. For every "gray day" blame the stratus cloud.

The stratus hangs low to earth and is often less than five hundred feet from the surface. It may be lifted fog or a low-hung cloud blanket. It produces the drab weather, the gloomy weather and the darkest days. It is a chilly proposition. The true stratus rarely ascends over two thousand feet.

Cumulus is a "pile," and no name more adequately describes the cloud that bears this name. The cumulus is the most frequent in occurrence, has the greatest number of variations, is the best known and best loved of all clouds.

The cumuli are great, thick lumps with flattened bottoms and with high-piled turrets and domes. Viewed with the sun above them they appear dark with brilliant white edges. When viewed away from the sun they may appear as pure white masses.

Nothing can give more food for imagination than the billowing cumulus. At one moment it is a mountain, snow-capped, with crags and precipices and great ravines. Again it is a high castle, towered, domed or cut with many spires and minarets. These may all fade and the cloud then call to mind some fantastic beast of childhood story.

This cloud type is usually the result of convection or heated air currents, and its formation can be noted on any warm summer or spring day. The thunderhead develops from a simple cumulus. The cloud may be formed also by the rising air in a low pressure area. It occurs but rarely at night for then the earth is cooling and does not heat the surface air which makes the cloud's formation.

PHOTOGRAPH BY THE AUTHOR

THE FUNNEL CLOUD

The tornado, usually derived from the peculiar, green-black base of a violent cumulo-nimbus, is a true cloud.

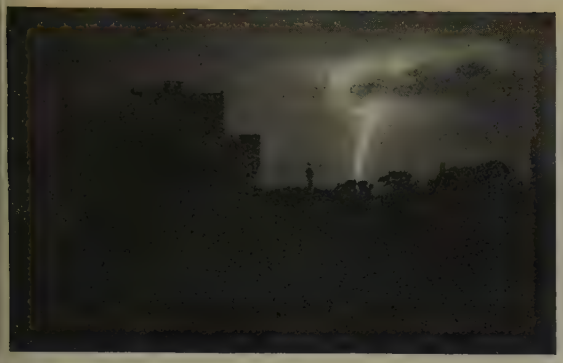
Nimbus means "storm cloud," and any cloud which gives rain or snow, sleet or hail is a nimbus. This is the least definite of cloud types and is the most transitory. A heavy stratus may at any moment become nimbus but when the storm ceases it is stratus again.

The general dense, dark sheet appearance that falling rain or other precipitation gives to a cloud accounts for the nimbus type. If it is not raining, the cloud is not nimbus but some other form.

These clouds develop from stratus or cumulus. There may be an oscillation from one of these types to the rain cloud and back again. Since the nimbus may result directly from other types, its height is determined by the altitude of the cloud from which it is formed.

As would be expected, there are many variations from these four type forms. There are, as well, many transitory forms from one to the other. Cirrus and stratus combine to form "cirro-stratus." This cloud is a thin, whitish veil which produces halos about the sun and moon. Those extraordinary and ominous light phenomena which are known as "sun dogs" are the result of a cirro-stratus veil over the sun. They are caused by the refraction of the sun's rays from the myriads of ice particles which compose the cloud. The middle westerner foretells the advent of a violent blizzard by the sun dog, and it is true that this particular cloud is most frequent in winter just preceding a storm.

If the cirro-stratus thickens, it loses the cirrus quality and becomes "alto-stratus." This



PHOTOGRAPH LEWIS MC MURDIE

THE NIMBUS CLOUD

The lightning flashes to reveal this formation in the sky.

ingly high cloud forms. They rarely appear less than a mile from the earth, and they may ascend to nearly eight.

Very high cumuli which are broken up into small white flakes that give the entire sky a scaled appearance are known as "cirro-cumulus." This cloud is a winter form that may occasionally precede the storm areas of summer, but it is never common. It produces the famous condition known as "Mackerel Sky."

If the flakes of cirro-cumulus become thicker and group into larger bunches, the cloud form becomes "alto-cumulus. This beautiful formation is popularly known as "Sheep Herd," and it is a favorite with the landscape painter.

"Fracto-cumulus" is the wind-torn cumulus with ragged and irregular margins. It is often very low, and the wind causes it to scurry rapidly across the sky. Early spring days with northerly winds often produce the interesting fracto-cumulus. It shares with low fracto-stratus and nimbus the marine name of "Scud."

PHOTOGRAPH LEWIS MC MURDIE

THE SHEEP HERD

An alto-cumulus formation seen only in occasional transitional form in advance of storm areas.

Cumuli which are so numerous that they nearly cover the sky give rise to "strato-cumulus," for the clouds then appear largely as a layer or stratum.

The cumulus type, which is the most majestic and awe-inspiring, is the mountain-high "cumulo-nimbus." At the base rain falls from a black, low floor, but above the cloud piles up into the heavens in a monstrous dazzling mass.

The cumulo-nimbus may increase until it becomes a violent and extensive thundershower and the nimbus floor may cover the entire sky, shutting out from view the cumulus dome. It is this cloud which is called the "thunderhead," is the common cloud form of early morning. As might be expected, both cirro-stratus and alto-stratus are exceeded-and sheet lightning is usually seen illuminating the dark interior of the cloud mass.

The seasons of the year determine, to a large extent, the types of cloud which will predominate. Not only will some types prevail at certain seasons but others will be entirely absent. One can recall that early spring days have a characteristic cloud, that summer days are noted for others, that autumn days and winter each have their own specific types just as they have their own specific weather and atmosphere. It is not going too far to say that a spring day, a summer day, a winter day are what they are because of their clouds.

No warm day of June or July fails to produce, in some portion of its sky-canopy, a cumulus cloud. These clouds are just as necessary to a summer day as are warmth and grass and flowers. If the day is very warm and sultry, the small cumulus may increase until it makes the great thunderhead, the cumulo-nimbus, and this is a cloud which comes at no other time of the year.

Just at sunrise on summer days the sky is occasionally overcast with cirrus or alto-cirrus and alto-cumulus, but as the sun comes into full power these dissolve, leaving a clear sky. Following this there is often "not a cloud in the sky" for several hours, but the afternoon will never pass away without the appearance of those exploded cotton bales —the cumuli.

The winter clouds may be the cirrus or, again, the alto-stratus which produces the light haze across the sky. Dark, gray days of winter are produced by low, even blankets of stratus clouds. This stratus may become the snowing nimbus of cold weather.

Autumn, while

AN EARLY SKY (below)

This picture shows fracto-nimbus clouds early in the morning.

PHOTOGRAPH LEWIS MC MURDIE

showing several cloud forms during the rainy days, is the most nearly cloudless time of the year. Day will succeed day in October and November during the periods of Indian summer with never a definite cloud. The air, however, seems to possess a haze which may be comparable to a very thin fog or may be only the increased dust particles of the season. There is occasionally a thin alto-stratus which adds haze above to the haze of the earth below.

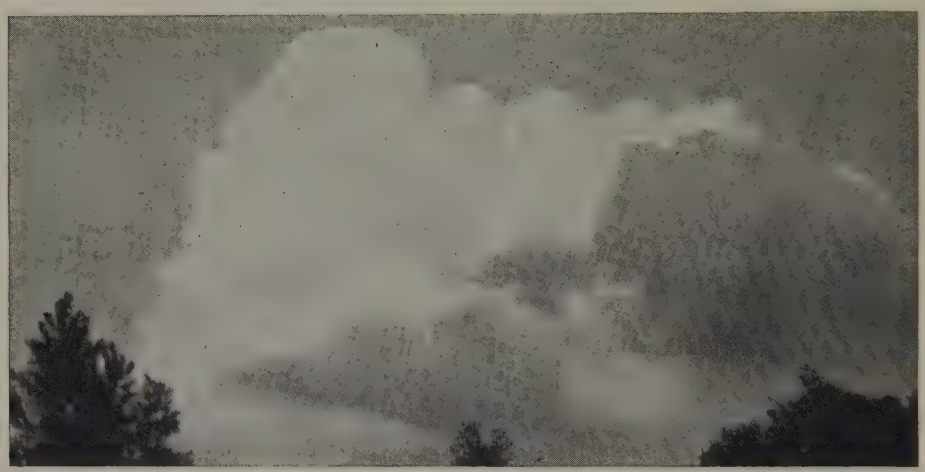
It remains for spring to produce the wealth of cloud array. The days of March and April will display great quantities of "Scud," the wind-torn rain cloud. This may be followed by gray days when smooth stratus predominates or followed by rain, the April showers falling from a floor of nimbus. Or, when the spring repents of one warm day and sends a period of northerly gales to remind us that summer isn't come, the sky may be filled with flurried, ragged cumuli, wind-torn and tattered in appearance.

PHOTOGRAPH BY THE AUTHOR

PROSPECTS OF CLEAR WEATHER

The setting sun is illuminating this rift of cumulo-nimbus in the breaking thunderstorm.

One cloud form may easily give rise to another. This is frequently the case. Cumulus may pass rapidly to cumulo-nimbus and thence to nimbus, or it may choose a longer route, pass to strato-cumulus, then to stratus and from thence to nimbus. If a powerful wind arises at the cloud level, the stratus may be rifted and thus give rise to fracto-stratus. May days will often show a rapid succession through all these cloud forms and back again.



PHOTOGRAPH LEWIS MC MURDIE

HERE WE HAVE THE THUNDERHEAD

The high-piled cumulo-nimbus, with the usual illumination of sheet lightning at the base is the most majestic cloud in all Nature.

After a fog lifts the result is a low blanket or stratus. The lifted fog may begin to rain, and then it is nimbus. If the wind strikes the stratus, it will be torn to patches of cloud, the fracto-stratus. Or, if the sun succeeds in conquering the fog oppression, the layer will form small cumuli which may eventually dissolve as the air warms leaving a clear sky.

The next time the evening papers report the approach of a storm area, watch this cloud succession the following day; the early morning will show wisps of cirrus scattered in patches across the sky. As these travel slowly from west to east there may appear a bit of that elusive cloud, the cumulo-cirrus, "the Mackerel Sky." Following this the flakes of the cumulo-cirrus enlarge until a billowy alto-cumulus covers the entire sky. These later clouds gradually lose their individuality until the sky is evenly overcast by the alto-stratus. Alto-stratus thickens to stratus, stratus thickens to nimbus, and the storm breaks. This transition may occupy several hours or the entire day, but it occasionally happens that all of these forms are visible at once as one views the sky from the horizon on the east to the horizon on the west.

As an aftermath to the great storm clouds of spring, there may come that notorious desperado among clouds—the tornado. Every violently stormy day of March or April or early May is a potential producer of tornadoes. These giant, whirlwind clouds come but rarely in the heat of summer. Nearly nine-tenths of them are recorded for early spring.

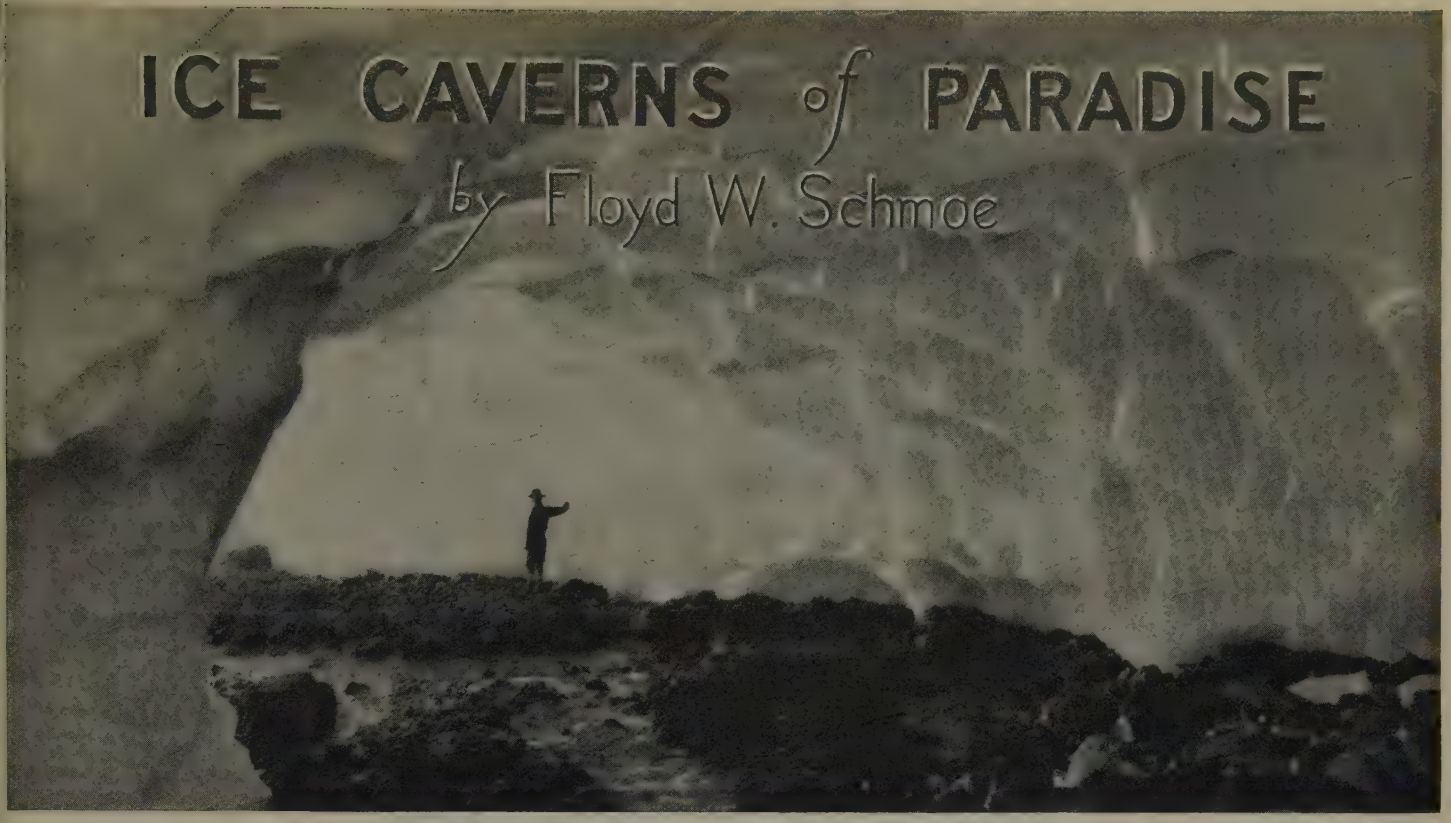
The April thundershower, with its hail and wind and great, green-black nimbus cloud, is the mother of this whirling destruction. Though its mother is the most awe-inspiring of clouds, the offspring is the most terrorizing and destructive.

The exact cause of the tornado is a matter of some dispute, but weather men have observed the general conditions for so many years that they can predict accurately just what type of storm or low-pressure area is likely to produce them. They cannot, however, predict the exact locality they will strike, for the path of a tornado is very narrow, fortunately, and it is a fickle creature of storm. As a cloud the funnel is the most famous of them all, as not a few communities will readily testify.

What do you know about weather. Charles Fitzhugh Talman will tell you in the July issue. It is only one of the entertaining articles in that issue, not to mention a page of silhouettes by Joe Cranstoun Jones, the crippled boy artist who wields inspired scissors.

ICE CAVERNS of PARADISE

by Floyd W. Schmoe



ICE CAVE BENEATH NISQUALLY GLACIER

Through a ceiling of pure ice the sun filters, changed to blues and greens that rival the most beautiful window of stained glass.

LESS SNOW than usual had fallen on the slopes of Mount Rainier, and during the summer the sun beat down mercilessly upon the snowfields and glaciers. The Paradise Glacier on the southern side, which usually remains almost entirely covered all year, began to show patches of blue ice early in the season. High up on the steep snowfields just below the Cowlitz Cleaver, little rills and rivulets of water began rushing down and piling up dunes of fluffy, sky-blue snow-crystals. Later, when the face of the ice was exposed, there were millions of these little waterways fretting and seaming the surface until it was covered with a network of ridges.

When the crevasses in the center of the ice river were reached, these streams dashed a hundred or more feet through the flow to the channel beneath. Countless thousands of such streams united finally to find their way under the lower glacier and emerge at the end, a full-fledged, rushing river. From the hundred-foot wall of ice that marks the end of the glacier, the Paradise River flows for a half mile over gigantic boulders, then suddenly plunges down over Sluiskin Falls into beautiful Paradise Valley.

The water from the surface is slightly warmer than the ice and melts caverns under the glacier. The warm air from without, carried by the suction of the rushing water, enlarges these ice tunnels into immense rooms and passageways, which honeycomb the lower surface of the ice. These are the ice caverns of Paradise. For thousands of years, perhaps, such caves have been forming, but only rarely, following winters of extremely light snowfall, are the openings sufficiently exposed to permit safe entrance into their fastnesses.

Paradise Valley, nestling against the glorious bulk of Mount Rainier, is well named. Here Floyd Schmoe, Park Naturalist at Mount Rainier National Park, tells us of another wondrous sculptor of Nature, this time working in the ice of Nisqually Glacier

This was such a year. Early in July we set out from Paradise Valley to effect, if possible, an entrance, and explore some of the caves. But we were unsuccessful. The snow still covered much of the glacier, and there were no openings except down sheer-walled crevasses or perpendicular "ice wells," a hundred feet deep, into which streams of water fell.

A few weeks later, armed with ice ax, ropes, and cameras, we again started out from flower-filled Paradise Valley, climbed the endless switchbacks to Timberline Ridge and scrambled down the boulder fields to the ice. Much of the snow had disappeared, but still there were no feasible openings, although in places we could see the white waters rushing far below, and in small tributary tunnels the roar of the river, coming up over impassable cliffs from the gorge below, made conversation impossible.

At last, near the terminus of the glacier, we found a small air hole which indicated that the snow was thin. With the ax we quickly made an opening and lowered ourselves to the river channel some ten feet below us. The sight which met our eyes can neither be adequately described nor pictured. Stretching away for a hundred yards was a low tunnel of crystal ice some twenty feet high and sixty feet wide arching over the mad, white water of the embryo river. Beyond, a large domed room appeared through the roof of which a ray of sunlight fell from a crevasse far above. Into this chamber other tunnels opened, and beyond, up dark passageways, could be seen ice bridges, waterfalls, and light wells.

The roof above, carrying thousands of tons of pure ice, was valuted,

made up of domes, like the nave of some great cathedral, and everywhere was diffused a wonderful light. Sunlight passing through the finest examples of stained glass windows never gave such effects. The whole area was filled — saturated — with the richest blues and greens imaginable, and along the surface of the white water there hung a haze of old rose and gold as though beams from a mountain sunset had been imprisoned there.

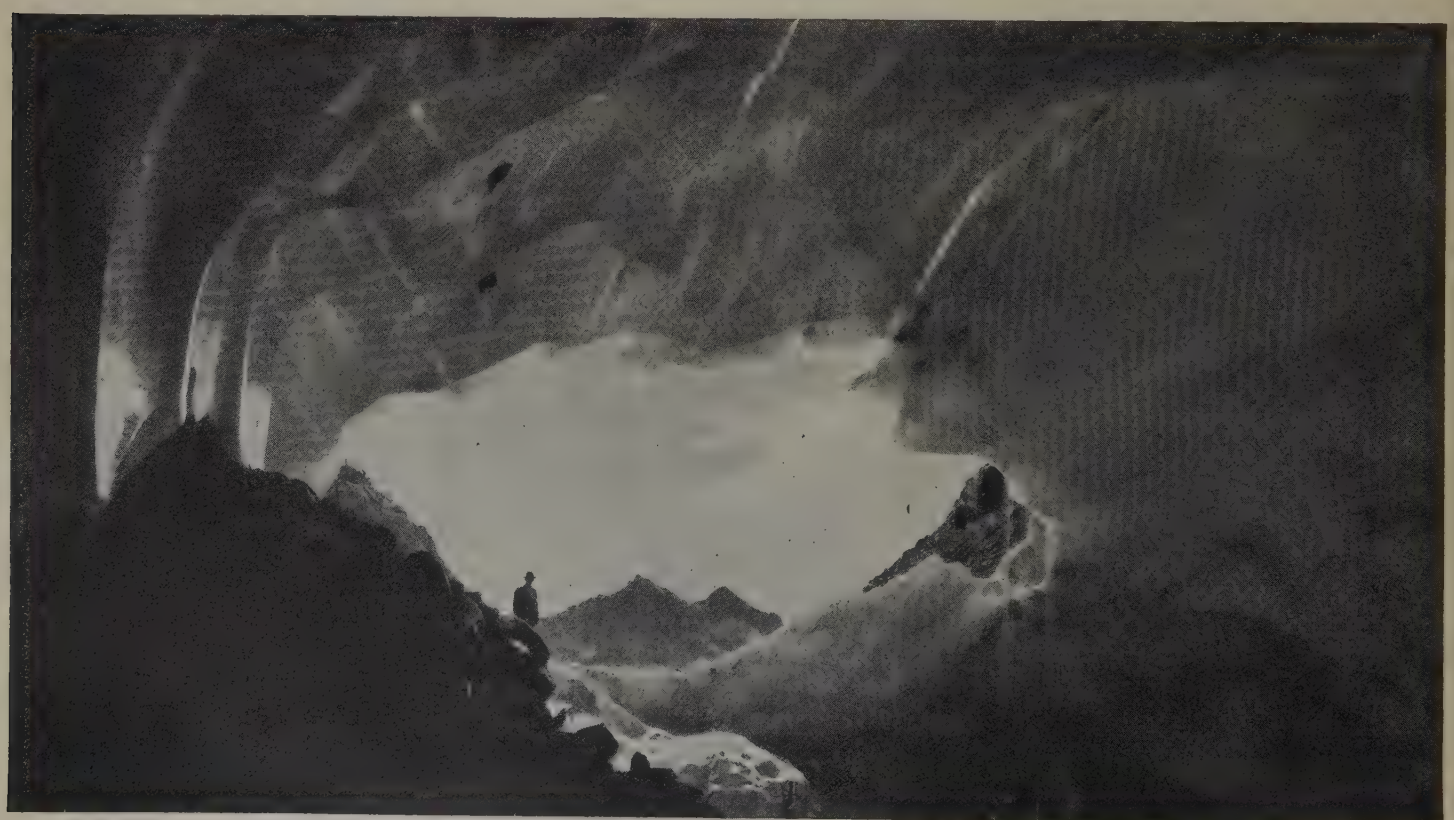
Looking above, there were areas of pearly white with everywhere streaks of clear ice painted every imaginable shade of blue and green by the sunlight beyond. No human artist, even with the rainbow for his palette, could equal those colors.

Coming out into the glaring sunlight again, we asked ourselves, as did Tyndall in his beloved Alps, who was the sculptor who performed this colossal work? And the answer was at hand. Even then he was climbing the eastern sky with the vigor of a thousand worlds still within him. It was he, guided by One Greater, who planted the glaciers on the mountain sides and who will eventually lay low these same mighty monuments.

MOUNT RAINIER REARS ITS GREAT BULK

The sides of the ancient volcano are girt with twenty-eight living glaciers, its peak deep in snow.

A great and noble monument is Mount Rainier. John Muir described it well when he wrote: "Of all the fire-mountains, which, like beacons, once blazed along the Pacific coast, Mount Rainier is the noblest." Standing third in height among the mountains of the United States, girt with many glaciers, rearing its white head into the clouds, it is worthy of being set aside as a National Park. Thousands climb its steep ascents each year by bus and motor to enjoy the beauty of Paradise Valley, to marvel at the myriad wild flowers of these heights. Many more climb farther, clad in true Alpine style, armed with ice axes and led by experienced mountain guides, to the snow-covered summit. Volcano it was and volcano it still is, although now it is dormant. Still jets of steam melt fantastic holes in the ice and at its feet are hot springs. Truly Nature has reared a great monument in Mount Rainier, a testimony to her power and her dominion.



DISTANT PEAKS IN A FRAME OF ICE (Below)

For uncounted years such caves have been forming, but only rarely do the seasons permit safe entrance.

Rhododendron, Glory of the Alleghenies

By Albert A. Hansen

(PHOTOGRAPHS BY L. W. BROWNELL)

TO THE multitude that thrills at the wonders of the outdoors, Nature holds forth no more inspiring sight than a mountainside in the Alleghenies during June and July when rhododendron holds full sway. Not just a few flowers, but millions of white or pink bouquets that enliven the slopes oftentimes as far as the eye can reach, presenting an alluring display of dazzling floral beauty. Handsome in foliage, strikingly beautiful in flower and withal possessed of a hardy constitution, rhododendron is an aristocrat among the native shrubs of America.

Indeed, so appealing is our native rhododendron that the plant has found its way across the waters and has endeared itself to many a foreign heart. Fortunately, rhododendron can be transplanted successfully, although plenty of leaf mold soil is often necessary in order to turn the trick.

FLOWERS OF THE RHODODENDRON

It is handsome in its bouquets against a background of shiny, leathery leaves. The wood is tough and durable.

American rhododendron, *Rhododrendron maximum,* reaches its greatest display on the slopes of the Alleghenies, although the species may be found in New England and as far north as Ontario and Nova Scotia. Another species, *Rhododendron californicum,* grows on the Pacific slope from San Francisco to British Columbia. Our eastern species is an evergreen shrub, occasionally reaching the proportions of a stately tree, with shiny leaves of a leathery texture. The wood is tough and durable, while the plant seems to attain a ripe old age. Once I cut the main stem of a gnarled, stunted specimen that looked like a weather-beaten old man in comparison with its fellows and with the aid of a microscope was able to count more than two score of well-compacted annual rings.

The flowers occur in handsome clusters, as though Nature intended to present them to us in bouquets ready to be picked. Some are pure white, others are pink and faintly spotted with yellow. The name rhododendron is derived from two Greek words that mean rose tree, probably in reference to species with rose-pink blossoms. Around the stem at the base of each flower cluster one can usually find a stick ring that catches ants and other robber insets in much the same manner as insects are caught on the bands of fly-paper with which some folks attempt to protect their trees. The sticky area is a clever device to prevent the pilfering of pollen and nectar by insects that render no pollinating service in return for the feast provided by the flowers.

AN ARISTOCRAT AMONG OUR SHRUBS

Here we have the handsome foliage and dazzling flowers of the native American rhododendron.

In the face of such glorious, lavish abundance as may be witnessed in the Alleghenies, when rhododendron is in full bloom, the species is probably in little danger of extinction. Nevertheless, the heart of every true lover of Nature must throb in protest

at the manner in which wild rhododendron has been commercialized. Entire trainloads of this magnificent shrub were sent out of the heart of the mountains to be sold in our large cities, leaving behind great bare spots in place of the brilliant display of shiny foliage and beautiful blossoms. Fortunately this practice has all but ceased in the face of many bitter protests.

Although admittedly one of the finest members of our native flora, rhododendron is not free of all fault. Both the leaves and blossoms of the eastern species contain a strong, bitter poison known as *andromedotoxin* that may prove fatal to grazing animals, while the California rhododendron is said to kill sheep. Some writers claim that the nectar is toxic, causing poisonous honey, but this is rather doubtful. The poisonous honey belief probably originated with Xenophon's description in "Anabasis" of the "Retreat of the Ten Thousand" through Asia Minor. The story relates that the soldiers gorged themselves with wild honey after which they became exceedingly ill. The trouble was attributed to poisonous honey which modern writers have claimed owed its source to a wild species of rhododendron that grows abundantly in the Trebizonde region.

Fortunately, the investigations of the United States Department of Agriculture have failed to locate a single authentic instance of human poisoning due to eating rhododendron honey, although reported cases have been investigated.

A Tailor in the Garden

OUR HEADS are in the air, so that we see clouds and trees and flocking blackbirds. And these are very wonderful, and good to look upon—but wonderland lies at our feet. There in the aisles of grass, among the hummocks of soil, lurk villains and banditti, and armored knights and lowly peasants, and there the princess sleeps. Craftsmen toil at their intricate trades, and slaves attend their masters, and nobles feast themselves on honey. It is the world of the insect. Have you heard of the leaf-cutter bee? He will serve as well as any to illustrate, as a gifted individual, the life of the little folk.

If you have a rose hedge—and who has not?—you have before now remarked that someone or something has snipped skillfully at the leaves, removing oblongs and circles and carrying them away for a mysterious purpose. Here the vandal has been as precise as any seamstress with her scissors, and here the cutting has been r o u g h l y done as though the goods and not the pattern mattered. But the circles are always neat, and though in nature, more commonly, nothing ever is quite precise, this tailor of the rose leaves is clearly a geometrician. You have come upon the work of the leaf-cutter bee, that solitary genius of the garden, who has a singular capacity for knowing what must be done and for doing it.

THE LEAF-CUTTER BEE
The tailor of the rose leaves is clearly a geometrician.

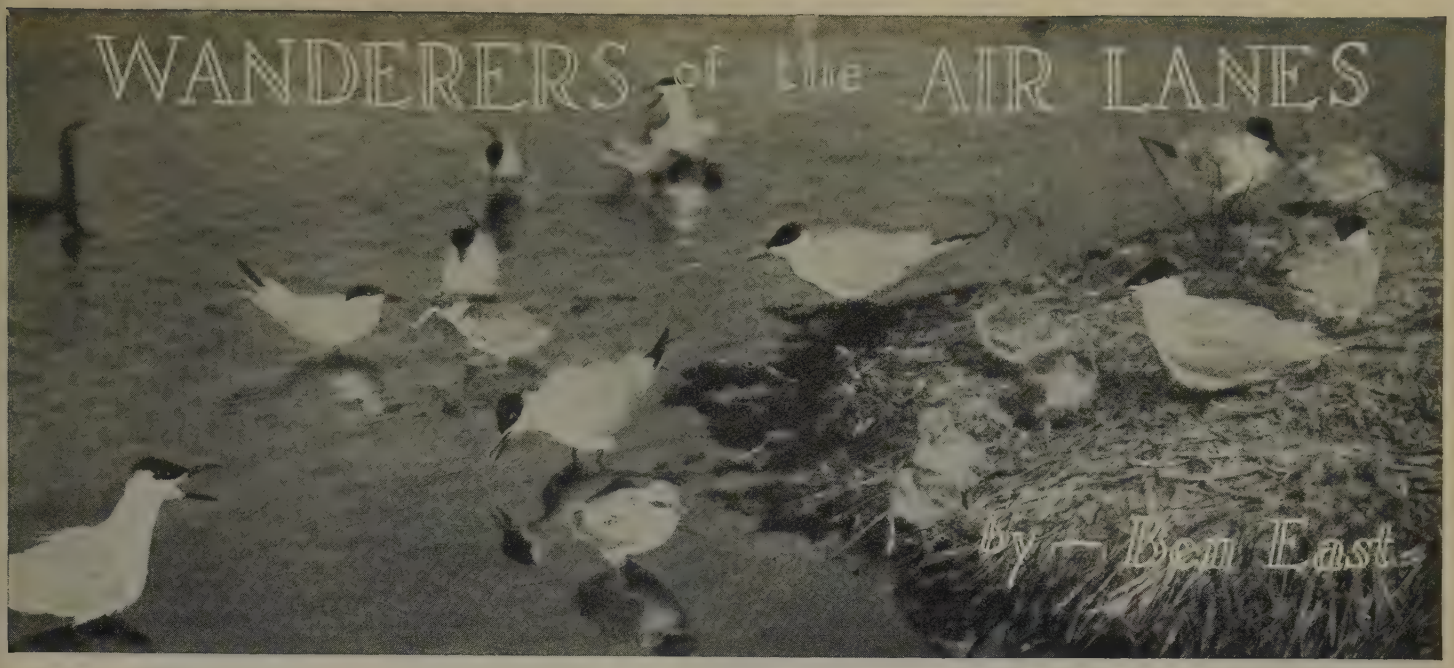
As to what he has done with the rose leaves, with the patterns he snipped and measured, you may not be so fortunate in discovery. But somewhere within a few score yards they have been deftly fashioned into a cradle for infant leaf-cutters and are securely hidden. Casting back over these paragraphs it is evident that one had fallen into the common though grievous error of attributing all industry to the male. It is so that we speak of insects, as often we speak of folk. The truth is that the tailoring of the leaf-cutter bee is achieved by the toil of the mother, as anyone should have known. She it is who cuts the rose leaf so carefully, and she it is who delves into the soil like any sapper, or bores the pithy stalk of a weed, to make a place for her handicraft. The cradle is a masterpiece.

Shaped like a cylinder, and of the approximate length and diameter of the familiar quinine capsule, the cradle of the leaf-cutter bee is rounded at one end, flat at the other, and so perfectly balanced by its contents that it will bob upright like the queer little dolls that are sold at fairs. It is laden with pollen for the regalement of the grubs that will some day have a rose hedge of their own. Of these cradles the mother bee makes many. She is no laggard at maternity, no novice at tailoring, for she fashions as many as thirty, and more than one a day. And into the making of each cradle goes a score of pieces, of which some five or six—that cap the entrance—are circular. It seems, indeed, the time to rise and say with much respect: "Ain't nature wonderful!"

There is a spider scrambling up from the center of a red rose—a portly spider, deeply dyed with orange and rascality. He has captured a hapless fly, not by the web the fowlers use, but as a hunter would by stalking and by stratagem and by prowess. A city of ants is on the trek, each purposeful citizen carrying a white and helpless infant. They seek Utopia. And under a chip somewhere, moist and snug, considering further exploits, rests that knave who causes burgomasters and governors to take counsel—the earwig.

B. H. L.

WANDERERS of the AIR LANES



PHOTOGRAPH WILLIAM L. FINLEY

OLD AND YOUNG CASPIAN TERNS IN KLAMATH LAKE

Birds in the great Oregon reservation that was before a reclamation project wiped it out and destroyed the home for countless birds.

By Ben East

SNOWY common terns, with black-capped heads, crimson bills and feet, and sooty wing margins. Smaller black terns, with dull black bodies and soft gray wings. Immature blacks and commons together, still in the speckled, clouded plumage of youth. All whirling like mottled chaff above a giant threshing floor!

This is what we found awaiting us when we reached Lone Tree Island and its nesting colony. Even while we were still some distance out from the island that morning, stray terns had begun gathering in a little worried band about our boat. Dr. Wood pointed them out with a significant nod. We were busy at the minute, removing bands from the copper wire on which they are strung, bead-like, for shipment from the Biological Survey, at Washington, D. C.—a continuous string of bands, seventeen feet long, each band less than a quarter of an inch in width; a thousand of them to the string. We removed one string complete, spreading them with small pliers till they dropped off the wire, and were incidentally opened wide enough to slip over a young bird's leg. Before the day was over we had removed half of another string, and used the most of them. We banded, in all, 1,434 young terns.

As we came nearer the island the birds grew thicker in the air overhead. White clouds of them lifted from the sandy island, to augment the cloud already hovering over us, till the air was filled with wheeling, screaming terns. A wonderful sight!

The trees outside the window were leafless and gray. The ground was white with snow. The last of the summer birds had departed weeks before, on their strange autumn migration. Winter had come. In the day's mail there had come a note, written hurriedly on a sheet torn from a field record. It read as follows.

"First returns from our operations:

Band No. 271,710—Common Tern—Taken September 15th, at Bay City, Michigan, by C. H. Coats. Bird found dead.

Band No. 271,681—Common Tern—Taken October 17th, at Fish Point, Tuscola county, Michigan, by Wood and Hastings. Bird shot for the University of Michigan museum.

Band No. 271,807—Common Tern—Taken November 3rd, at Pensacola, Florida, by F. M. Weston. Bird found dead. Signed—Hastings."

The author's mind turned back to a warm sunny day last July, spent with Walter Hastings, Michigan naturalist, and with Dr. Norman A. Wood, of the State University staff, on Lone Tree Island, in Saginaw Bay, banding the young of what is probably the largest nesting colony of common terns in the United States. Here is the story this memory invoked.

In the patch of rushes growing in shallow water near the island, as we waded ashore, we found the first baby tern. Only the black terns nest in these patches, building on the dry bars, or on a floating platform of dead reeds. In this one small patch we found six nests of the blacks, and on the first of these our infant stood up and peeped valiantly at the giant intruders in watery solitude; a tiny umber brown chicken, mottled with black. While we photographed him we noticed a mother tern hanging anxiously over the reeds at the far side of the little green jungle. Her clutch of three eggs were hatching. Two of them were pipped wide open, the shell halves still clinging to the imprisoned babies, and the third was broken in one tiny spot. She knew that the little brood needed the warmth of her body to aid their progress in entering the big world, and in her mother anxiety she all but defied our presence, hovering low over the nest and all but alighting on it time after time. We hastened away as soon as we could, leaving her to the reward of her weeks of patient brooding. Of the nests in that patch of rushes only two others contained eggs. The rest had served their purpose and were abandoned. Mid-July is late for nesting. The apex of the season is past.

Late in the season as it was, though, Lone Tree itself was still dotted with the nests of the common tern. Dr. Wood estimated the number of adult birds on the island at five thousand. An inexperienced observer would have

said double or treble that number. It was necessary to watch every footfall, to avoid crushing eggs or young birds under foot. The terns lay their eggs on the bare sand or, at best, build only a flat nest of broken bits of rushes, and the eggs have a dull blue background, splotched with black or brown. Not at all easy to distinguish on the pebbly ground, and half hidden by sparse vegetation. Two eggs are the usual clutch, though three are not uncommon, and we found and photographed one nest that held four.

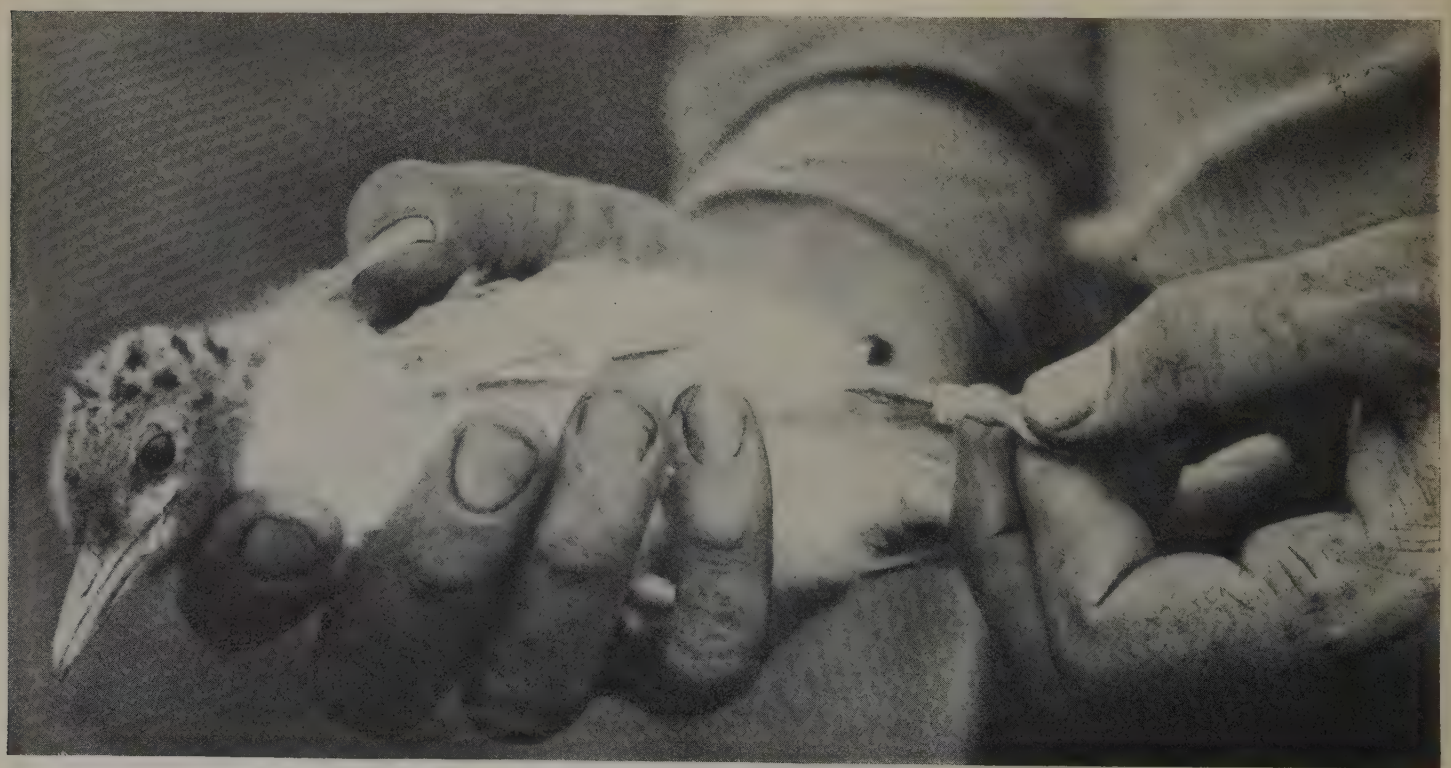
WE FOUND A BABY BLACK TERN

"It stood up and peeped valiantly at the giant intruders into its water solitude." The mother hovered near.

The young terns were hidden everywhere. In clumps of thick, coarse grass, under tall thistles or milkweeds, among the tangled roots of the dead willow brush, and thickest of all, in the cool shade of a thick green band of smartweed, bordering the sandy beach. Little tiny fellows, covered with gray and black down, only a day or so from the egg. Ranging up from these, through all the sizes, to the big gray chaps in full plumage, with black crests and snow white breasts, who a day or two later would be with the screaming horde overhead, we found a veritable rich mine of terns.

How they could run, these fully developed babies who did not quite dare to trust their wings. It was easy to catch them the first time. They lay quiet in their shady retreats, seeming to think themselves safely hidden so long as they did not move. We picked them up, attached the light metal bands, and set them free again. Away they went, running through the weeds, over roots and dead willow brush, tripping and getting up again, till they thought themselves safely out of sight. Dozens, not satisfied even with that, kept straight on through the band of smartweed, across the sandy beach to the edge of the water, and then swam straight out into the bay. They swim, apparently, as soon as they can run about, and long before they are able to fly.

Over these refugees, as they fled, an anxious mother hovered, mounting aerial guard. By what magical instinct or knowledge they accomplish it, I do not know, but it is certain that every mother tern above that island identified and knew the whereabouts of her young, as positively as she knew the



FASTENING THE LIGHT METAL BAND

This little ringlet is provided by the United States Biological Survey for use in bird banding work.

location of, and recognized, her own nest, before the babies were hatched.

Almost invariably, as we picked up each young tern, an adult bird singled out from the flock overhead, and swooped down at us on set wings, checking just above our heads with a sharp squall. Hundreds of other birds circled overhead and screamed, but they did not dart down at us. This particular young tern was none of their immediate concern. The mother, however, continued her angry dashes at us, as long as we remained near her baby. When we had banded him and moved on, she rejoined the wheeling horde again. A few yards away we picked up the next youngster, and another mother instantly separated from the flock, and voiced her anger and fear for her young.

WE FOUND ONE NEST OF FOUR EGGS

Two eggs are the average clutch of the Black Tern, although often there are three and rarely four.

In the afternoon Dr. Wood went wading in the rushes east of the island, in search of the young of the black tern. He left his shoes on dry land, turned up against a big rock at the water's edge. An hour later he found there, hidden between shoes and rock, a half-developed baby tern. He lifted the bird out from its hiding place to be banded, and instantly, from the multitude of tern overhead, a white meteor shot down at him, screaming. They were fifty yards from the nearest patch of vegetation or the nearest nest. The mother must have followed her baby's flight, out from the grass, across the wide flats left by a temporary lowering of the water, to the shelter of the big rock, and there waited to protect him. Walter Hastings had watched, from his blind, a crippled tern alight and feed the same baby five times in the course of an afternoon. Proof beyond denial that they know their own young!

PHOTOGRAPH DR. E. L. HENDRICKS

BLACK TERN ON HER NEST

She builds her home on dry bars or on a floating platform of dead reeds, and zealously guards her nest.

I followed Dr. Wood on his quest for young black terns in the patches of rushes east of Lone Tree. On a low bar, bare even of reeds, a half mile off the island, I found evidence of a strange natural tragedy. I came on a young tern, large enough for flight, lying dead on the sand. He was nearly mature, and in a bedraggled condition, so at first I mistook him for an adult bird. We had watched all day for dead adults, who might bear bands from last year's work on the island—1,356 birds were banded there a year ago—so I turned this bird over to look for the band. He bore none, but as I moved him something heavy dragged at one of his feet. Tightly clamped on his left leg was a clam shell between two and three inches long. The leg was badly frayed where the shell had worn into it, and this hindrance to his freedom had plainly caused the bird's death.

The fresh water clam lives more than half buried in the sand, with the halves of its shell partially open to permit it to inhale and exhale water, carrying it oxygen and food. The tern, wading in shallow water on the flats, had evidently stepped into this natural trap, which snapped shut on him before he could withdraw his foot. As long as the foot stayed within the shell, the clam would of course exercise his only instinct of protection and remain clamped tightly shut. The tern must have died finally of starvation and exhaustion. His unwilling captor was dead too, when I found them, from being so long out of the water, but the grip of his shell on the bird's leg was unrelaxed.

In the afternoon, from Hasting's blind at the head of the island, we photographed a single mother tern on her nest. We had but a few minutes to wait after we had settled in the tiny blind. Once we were out of sight, the flock overhead began to diminish almost immediately. The birds settled down into the grass to attend the nests or feed the young. The ceaseless mewing cries grew less plaintive. The restless wheeling of those still in the air ceased, and out of the orderly, busy flock the mother bird dropped down to her nest. She stood for a

brief instant over the eggs, sharply alert, her wings still outstretched. Then she folded them, crossing the tips painstakingly behind, glanced about again, and settled on the nest. We photographed her there more than a dozen times during the afternoon, and after each shot we were obliged to leave the blind to change the plates, frightening her off the nest. Yet each time, within five minutes she was back, her motherly loyalty overcoming her natural suspicion of blind and camera.

One desire of our trip was not gratified. That was the finding of a bird bearing a band from some previous year. We studied hundreds of them in flight overhead, through our glasses, but they fly with the crimson feet drawn up close against the white body, and so small an object as a band could scarcely reveal itself. It is almost certain, however, that many of the adult birds in the great flock wore bands. Of the 1,356 banded there last year, only seven were reported back to the Biological Survey; one from Sarnia, Ontario, when the autumn flight was just begun; another a little later from Waukegan, Illinois; then during the winter, one from Mexico, one each from Corpus Christi and LaGrange, Texas, one from a small town in Florida, and one from Texas, Georgia. Such is the distance these Lone Tree dwellers put behind them on the fall migration.

Our last view of the island was through the glasses, across four miles of blue waves, gold tipped from the westering sun. A thick cluster of willows at the northern end lifted like a low green hillock. My last thought was of the mother tern we had watched from our blind, on her nest at the edge of that green thicket, faithful and loving in her maternal duty.

The Many-Legged Moccasin

By Doris M. Cochran

Division of Reptiles, U. S. National Museum

PROBABLY every one who has ever watched a snake moving over rough ground has been impressed by its absolute precision and swift grace. When undisturbed, the snake glides over sloping rocks, worms its way through matted tufts of grass and even penetrates thickets of briars with the greatest ease. By a remarkable adaptation of the bones of the spinal column, the snake, entirely without limbs to aid in its locomotion, nevertheless can travel quickly on land and can swim even more readily in any depth of fresh water. On occasion, some kinds can climb trees and pass from branch to branch.

There are over two hundred precaudal vertebrae in the spinal column of the moccasin snake, each vertebra holding a pair of long, curved ribs. In cross section, a vertebra appears five-sided, with the upper part greatly prolonged into a neural spine. Above the body of the vertebra is a channel through which the spinal cord passes. Below this channel on the upper surface of each vertebra is a cup-like depression into which fits a ball-like knob arising on the under surface of the preceding vertebra. In addition to this, near the base of the neural spine is a pair of wedge-like processes which project forward and fit into corresponding depressions of the vertebra in front. This very perfect bony structure gives to the snake's backbone extraordinary flexibility and strength. The marvelous system of muscles attached to the ribs enables the animal to bend into almost every conceivable position.

RADIOGRAPH OF A LIVE MOCCASIN SNAKE

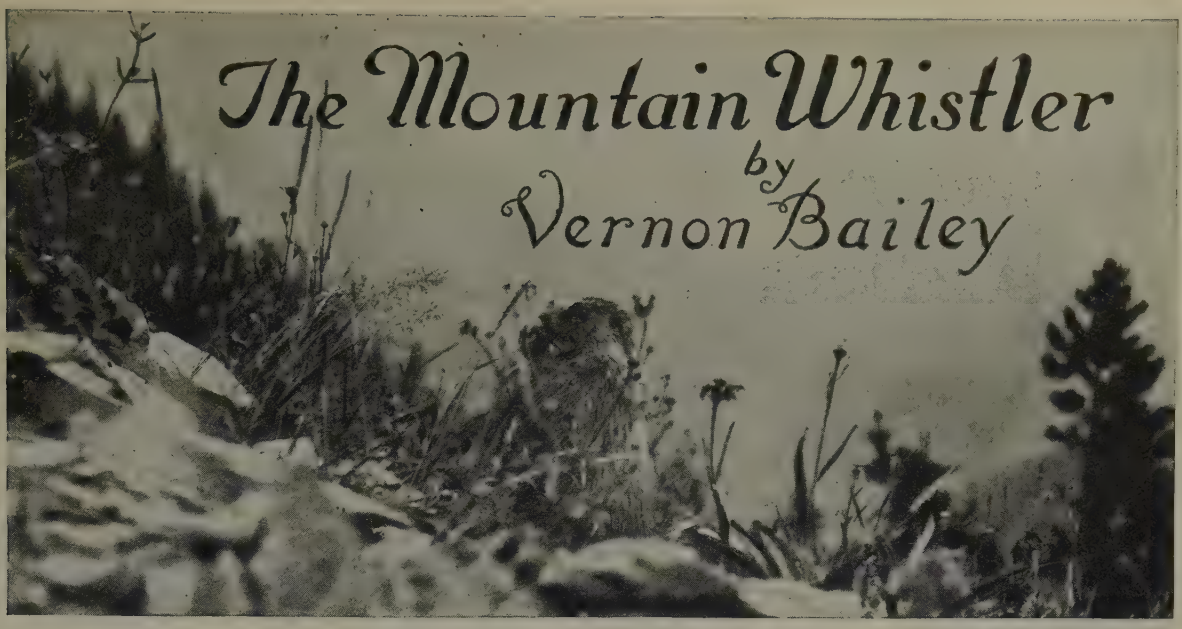
This photograph was taken by X-ray by P. P. Ghent of the Toronto, Canada, General Hospital. The snake was given a dose of chloroform but was none the worse for it afterwards.

In addition to this highly complex internal structure, the external covering of the snake's body also has much to do with successful locomotion. The skin of the entire ventral surface of the body is covered with very broad scales, or "scutes," as they are called, which overlap like shingles on a roof, in such a manner that the unattached edge points backward.

To each scute a pair of ribs is fastened by means of strong ligaments. When the snake crawls, the ribs are thrust forward all at once, a leverage on the ground is effected by means of the exposed edges of the scutes, and as the ribs are bent backward again, the body is drawn forward. Thus the ribs function just like so many little feet.

The Mountain Whistler

by Vernon Bailey



PHOTOGRAPH MYRTLE E. JOHNSON

HALF-GROWN HOARY MARMOT AT LUNCH

The whistler is busy eating raisins from the photographer's lunch and sits for its picture.

CHUR-RRRRRRRRR—sounded the long level whistle of the great hoary marmot, and every little and big whistler in the Alpine meadows of Gunsight Pass sat up and took vigilant notice. It was not a bear this time, only a man that came blundering over the rock slide, but on general principles of precaution, each marmot for a mile around that had caught the first warning note galloped to the nearest boulder or ledge and sat up to look over the slope below for an approaching enemy. From below their enemies usually came, for their home was far above timberline, along the rocky crests of the range, where little meadows and benches of wonderful Alpine plants supplied their needs in the way of food. The bears from below and the eagles from above must be watched for at all times, and without the code of long and short whistles that carry far across from cliff to cliff, few of these huge, gray-coated woodchucks would ever live to grow to full size and lay up the quantity of fat required to carry them through the long winter's sleep.

At seven thousand to eight thousand feet above sea level, where immense snowbanks last all summer and great glaciers send down roaring streams of milky water or crashing avalanches of broken ice, even the summers are cool and snowstorms frequent in June, July and August. But there are enough warm days to make the little plants grow and blossom in great beauty and profusion and ripen their seeds before the September snows again bury the mountains for winter. The little plants growing in carpets over the moist slopes and meadows soon become loaded with ripening seeds. The whistlers gorge themselves on the plants and flowers and seeds, all chewed up together, until their sides bulge out and finally their big loose skins and every nook and corner of the body cavities become well filled with thick layers of oily fat. Satiated, they slow up their energetic food gathering, become sleepy and quiet, and as soon as the cold fall days begin they go deep down into their warm grass nests under the big boulders or into deep burrows in the side hills and go to sleep, and sleep so soundly that they do not awaken until the warm spring days arouse them. From September to April they are buried deep under the snows, oblivious to the cold and storms above, and when they do awaken in the spring they are still well supplied with fat that carries them through the mating season and until the spring plants are again available for a food supply.

PHOTOGRAPH MYRTLE E. JOHNSON

THE MARMOT CONSIDERS THE SITUATION

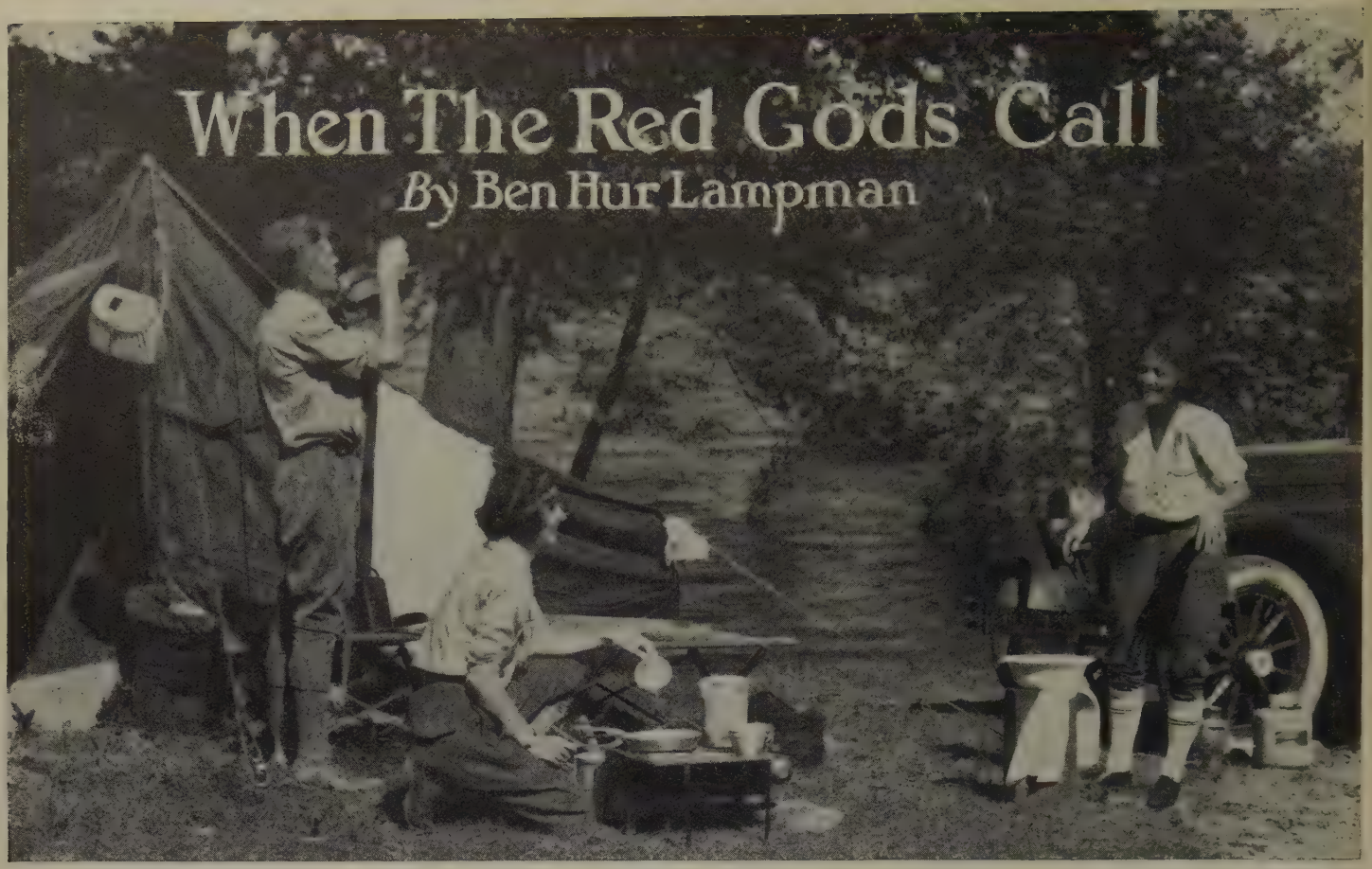
He knows that bears from below and eagles from above must be watched, but a camera is something new.

In July the cunning, little, gray-nose young whistlers come out of the burrows and soon are gathering flowers and dainty plants for food and growing as fast as they can, so as to get fat before the cold weather comes again.

And so the round year goes and has gone for so many round years that the whistler fits into his environment and would not be happy or contented elsewhere, even in the luxuriant clover fields of the valleys where his smaller and less vigorous cousins, the brown woodchucks, make homes.

When The Red Gods Call

By Ben Hur Lampman



PHOTOGRAPH H. ARMSTRONG ROBERTS

Now is the moment of the year when our thoughts demand to ramble vacationward. We asked Mr. Lampman, with his facile pen and love of the open spaces, to put these thoughts to words. He has done so here in an article that is instructive, entertaining and, also, carries some real messages.

WE HAD forsaken the trail and lost the river, and the rounded ridges were solemn green duplicates. Somewhere a ruffed grouse sounded, dimly drumming, and in that direction might lie the stream. Listening to catch the monotone of its distant rapids we heard only the voice of the wind in the firs, and the creakings of a leaning tree. Surely the trail was yonder, to the left. But it was not. And so we were lost in June, and we liked it well. We cast ourselves down in the short thick fern and watched the pool of sky above us, and knew such contentment as never is found elsewhere. For the afternoon would be long, and the river could not escape, and the trail might wait. And there we read, from a book no larger than a memorandum pad, that sonnet which begins:

> The world is too much with us; late and soon,
> Getting and spending we lay waste our powers;
> Little we see in Nature that is ours. . . .

How we found ourselves is a matter of no moment now, for it was simply done, and I think we had but played with the thought of being lost. We were, at the time, of that vast company of refugees which flees the town from June onward, until late fall, to find healing for both spirit and body in the forest, or among mountains, or beside rivers and those pools of providence that are called lakes. We followed the gods that Kipling has called the "red gods," and these are very ancient and unfailing. I know of none to whom they will not grant comfort, and renewed cheerfulness, if he but petitions them properly, and walks in humbleness where they abide—and that this is true is no longer a secret shared by a few fortunate ones, but a knowledge common to the American people. The immediate profit of that knowledge is an intimacy with Nature, and its eventual gain is—I doubt not—a longer and a happier life.

Well, they are listening to the red gods now, the thousands upon thousands of rebels against the enforced commonplace; yes, and they are answering them. It is the season of the auto camp and the motor tourist, where Maine and California meet. The season of the perfect riffle and the well-placed fly, along a stream that is quite lost in the ranges, and that may be reached only on shank's mare, with pack horses bearing the outfit. It is the season, too, of the end of the trail, when one stands at the foot of the snow-peak and marks a shining thread that is the infant river. The season of lakes suddenly revealed as the last hill is scaled. And people say that they seek these places, and search these trails, for a vacation, as they call it. Perhaps. Yet I am sure they find something of greater value there, something of permanence; something less tangible than a creel of trout, less visible than a coat of tan—a friendship they had laid aside. How curious it is that, though the world is "too much with us," we may never quite elude that friendship, but must turn again to the forests and the hills when we are tired.

And what does one take with him when he elects to become a refugee? (The masculine pronoun is for con-

venience only, since often you may not tell by the trousers when you are far from town.) And how should he comport himself? The last is easier to answer than the first, and you may answer it for yourself. The first I should hesitate to answer, knowing well that there are many who do not need such primary advice, and that anyway it is all in the books, and that further there is deep satisfaction in learning it for oneself. Too, I am one of those who delight to travel light at times, and to be freed of properties that possess their owner. But the indispensables of the refugee are not to be scoffed at, and by your leave a few may here be touched upon.

In the matter of cooking utensils and table equipment one may be as primitive as a Patagonian or lavish as a bride. There is a tin-cup hanging on a limb of the pie-cherry tree, close to the goldfish pond. Beyond doubt it once held beans or cove oysters, yet some practical mechanic with the soul of a Keats hooped it with baling-wire, bent the twisted strands to a handle, and christened it in a spring that seeks the swiftness of Lewis River beyond the place called Cougar. There I found it and thence I brought it home, as a treasure of our tin Americana. And times when I drink from it, under the pie-cherry tree, I hear the salmon floundering through the white shallows, and have a scent of green fern and cool. This improvised tankard, that has held many a steaming brew of black coffee, I consider a fine example of something contrived of nothing. Yet it is not well to put your trust in tin cans, for the convenience of a proper kit is matched by the comfort derived therefrom, and sundry practical specialists have given much thought to this equipment. There are fine sets in both aluminum and tin, so cleverly contrived that pans and kettles nest one in another and occupy a minimum of space. The frying pan, of course, should be of light steel, with a handle of ordinary length. But as for handy sundries, there is nothing, as any camper will vouch, so ordinarily needful as a lard pail and its cover.

A word here of the cooking fire. It should be little and brisk and concentrated, that first the kettle may boil and that thereafter the bacon or fish may be fried over the embers. It is no small matter to nurse a sunburn in the too ardent warmth of a blazing fire, and of such discomforts one cannot have too few. The fact is that many of us really work hard at our outings, whereas these should and could be but the lightest of light housekeeping. And if you choose to exchange the wilderness way for something the least bit more practical, and if transport does not trouble you, there are many kinds of camp stoves to be had and all of them excellent. Moreover, the camp stove has the advantage of superior safety. These forests of the centuries, how hateful the thought that one might be the cause of laying waste such beauty and such welcome.

There is no need of this. It is all so pitifully needless, so easy to avoid, to anticipate and guard against. The time to recall the fateful spark is before it is sped, tangled as the logic may seem. Only the careless, the witless or the criminal loose the forest fire to its work of destruction. And above all else, whether it be equipment or pleasure, time or travel, the prevention of forest fires should be the first concern of the guest of the forest.

As to the apparel of the vacationist I think he carries coals to Newcastle who would presume to advise the modern generation. Of sweaters and shirts, and mackinaws and socks, and whipcord and khaki suits, it may be said that these no longer are mysterious attire. Why, in favorable season we are almost a nomadic people, who but yesterday were villagers; and Maine and Oregon are nearer now, the one to the other, than sister counties were in the old days—or so it seems. And we have learned to dress the part, and to carry ourselves with that hint of virile jauntiness that once was the caste mark of the young civil engineer, splendid in his laced boots, his corduroys and his open flannel shirt. Many a bank clerk now, on his holiday, is a proper figure for the novelist who used to specialize in "the great open spaces, where men are men." Yet I hold we have something to learn, or most of us, as concerns shoes. Do you remember the horse that was lost for the want of a shoe, and the rider, and the battle, and all the rest of it? A doleful adage. Yet many an outing has been lost to enjoyment for the want of sensible shoes.

"Armor is heavy," quoth King Arthur, according to Twain, "yet it is a proud burden, and a man standeth straight in it." And, truth to tell, it is so with the shoes of thick, pliant leather, the tall laced boots, which we wear when we would adventure with the outdoors. They are somewhat heavier than the shoon of the commonplace, as they have need to be, but all the art of the cobbler is in them—if they be wisely chosen—and they glove the foot, the ankle and the calf in so comradely a fashion that those who wear them know that same pride the knights knew; a

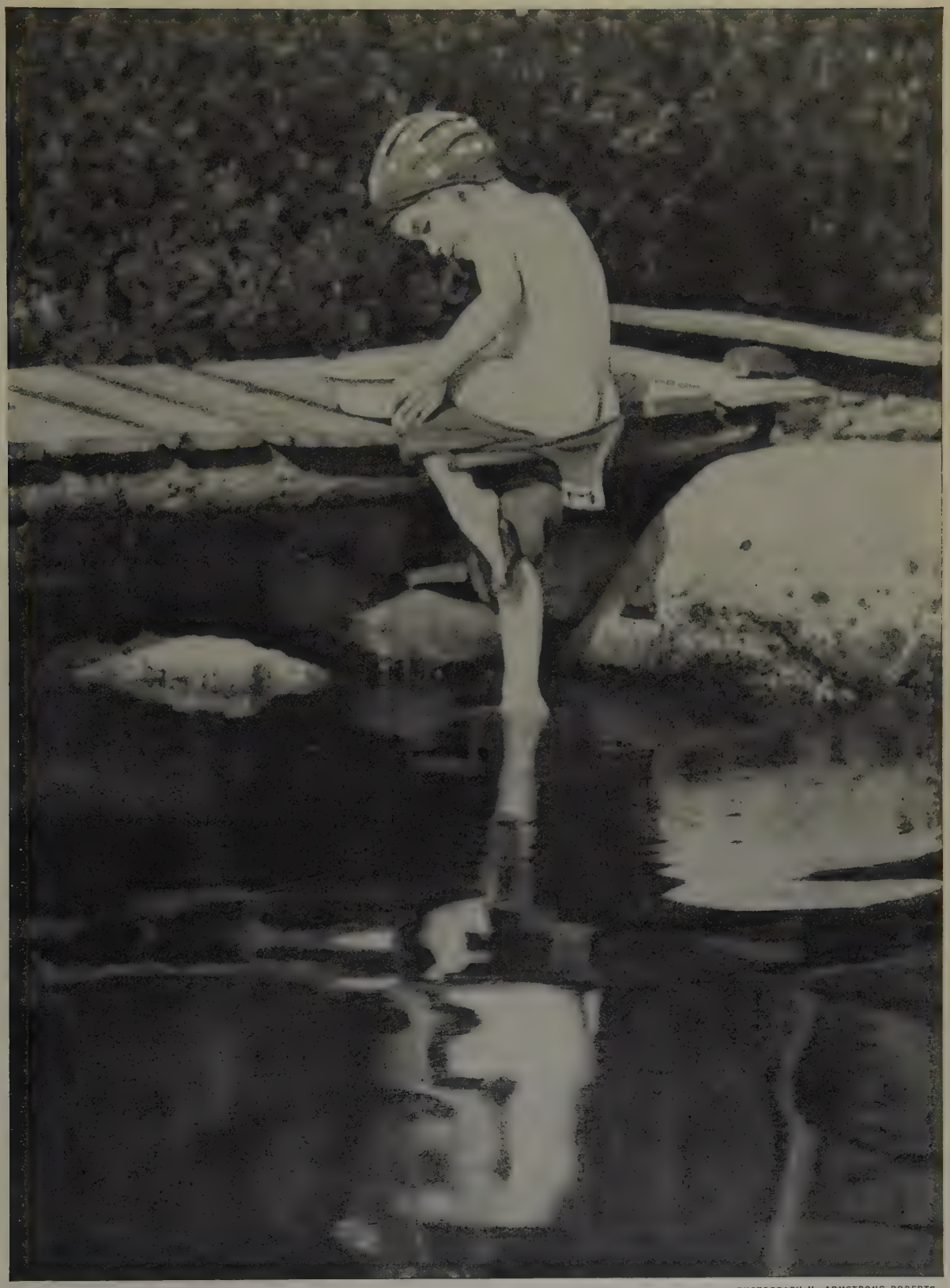
PHOTOGRAPH H. ARMSTRONG ROBERTS

THE PADDLE RIPPLES THE SILENT STREAM

What is vacation without some water on which to float and a canoe to float in? It is continuous adventure and good for heart and body.

PHOTOGRAPH H. ARMSTRONG ROBERTS

"WE HAD forsaken the trail and lost the river. . . . Somewhere a ruffed grouse sounded, dimly drumming, and in that direction might lie the stream. . . . And so we were lost in June and we liked it well."



PHOTOGRAPH H. ARMSTRONG ROBERTS

"TO FIND the healing for both spirit and body in the forest, or among mountains, or beside rivers and those pools of Providence that are called lakes . . . we follow the gods that Kipling has called the 'red gods.'"

pride and confidence in such equipment as shall serve them well. How otherwise it is with footgear not suited to the trail, nor to the foot of the traveler. For man and boot are soon at outs, and are irksome one to another, and there is little delight in the day. I have spent much time in the reprobation of distant and unknown cobblers when I should have been casting a hackle where the riffle breaks, or musing on that dignity which is the secret of a cliff.

COURTESY ELTO OUTBOARD MOTOR CO.

RANSOMED FROM OFTEN IRKSOME DRUDGERY

"The cheerful outboard motor sets the voyageur free to contemplate the scene. It is a little friend of the inland waterways."

A good knife and a clever axe—what friends are these. They or their equivalents were the accouterments of the first father who dared leave the cave fire after nightfall. The haft of a knife has a friendly feel, and the swing of a well-balanced axe is a joyful response. These are companions that must always accompany one when he leaves behind the conveniences of an ordered life, and makes bold to be a vacationist. The one shall scale his fish and slice his bacon—aye, and mend his gear—while the other shall find him pitch and firewood, and blaze a trail and drive a tent peg, and do a hundred services unanticipated. These two shall make his bed for him, from the green boughs of the conifers, and I am sure he shall sleep the sounder because they have befriended him, and given play to his shoulders, his arms and his wrists.

Yet of sleeping bags, air mattresses, automobile beds and all manner of camp beds designed to fold ever so cleverly, the outdoors equipment market affords a wide range of

PHOTOGRAPH H. ARMSTRONG ROBERTS

MAN AND BOOT ARE SOON AT OUTS

One should be shod in footgear that glove the foot, the ankle and the calf in a comradely fashion.

choice—and my opinion is that the hardy bordermen of other days would have been well pleased to have such comfort. The red gods grow lenient, and if your trip admits of comfort there is no shame in having it. One might as well contend for the inalienable right of the woodsman to be bitten and gored by midges and deer-flies, when a simple lotion will dissuade these bloodthirsty ones, as to hold that real roughing-it consists wholly of searching for primitive discomforts. Remember that the first sulphur match was a luxury; and, by the way, there is no better match for the adventurer. It has the virtue of reliability, and if it be damp you may dry it in your hair.

And this about the fire your axe and knife shall furnish fuel to feed—start it with small splinters of dry wood, and if it is windy or raining hold a shelter of some sort over the fire as you kindle it. Thereafter, until it shows unmistakable signs of spirit, tend it lovingly until by its own flaming heat it shall defy both rain and wind, and damp fuel likewise.

Be very sure always to remember—there is another camper to come. Though it should matter little to you if none ever came, since a proper attitude toward the open, toward the spring, the river and the wood, should dictate the leaving of a clean and orderly camp in any case. To this end burn the old papers and all combustible refuse; bury that which will not be destroyed by fire; leave a little firewood for the next visitor; leave the trees undefaced, the ground without trash and the water supply without contamination. It is a mournful and a maddening sight to see, on the white bubbling sand of a hill spring, sundry jackets of hard-boiled eggs, dregs of coffee, and the gray rag that served some slouch for dish-clout. Come nearer, and listen attentively. There are people who should be forbidden the open. They daub and smirch it so.

PHOTOGRAPH A. J. ANDERSON

THERE IS LURE TO THE OPEN ROAD

It leads us somewhere but happiest he who knows not where nor cares, for then it is mystery just ahead.

Here is a singular and not unpleasing thought—at least to many of us. The stern old red gods, who summoned Kipling's young men so compellingly, have of late grown tolerant and the least bit sophisticated. They have conceded progress in the virile art of roughing it, to the end that it is not quite so rough as once it was. The outboard motor for example—which has ransomed us from the joyous but oftimes irksome drudgery of oar and paddle. Where Cooper's Indians sped their canoes by dint of a stout blade and a sinewy arm, the cheerful outboard motor now sets the voyageur free to contemplate the scene. And likewise where the gentlemen adventurers of the fur companies followed the broad Columbia to the chant of a paddle song, there sounds the effortless exhaust of this little friend of the inland waterways. Romance, you say, has departed? Why, sir, they said as much, beyond question, when the pole gave way to the paddle, and said it again when the paddle was replaced by the oar, and yet again when ships sprouted white sails and were winged for deeper seas. In any event, it is all a matter of preference, and one should play the game as he sees it, though always according to the rules. Saxton Pope and Stewart Edward White journeyed to Africa to shoot lions with the broadhead arrow and the long bow. It is true they succeeded, after a fashion, but they kept their rifles at hand, and their success with the primitive weapon only confirmed an inner feeling that, after all, there is no friend like the rifle—in a pinch. I cite this merely to show that the times change, and viewpoints with them, though the comparison is not exact. There is work enough for both paddle and motor, and surely there is space and to spare for each.

One is not the serf of his possessions. I recall that on the Rogue, at a time when we were far from any base of supplies, and the trout were rising so briskly we might not spare an hour away from them, a certain fellow-fisherman kindled a fire in the sand and left it to subside to glowing embers. Meantime he fished, but when that fire was ready for the rite we raked the coals aside, and the pale, scorching sand beneath, and to this hollow we confided four fine cut-throat trout, heavy and fat. These we covered with the heated sand, replaced the embers, tossed on wood once more, and left to the culinary skill of the red gods. In a half hour, wet and cold and famished, we waded again from the river, with heavy creels, and brushed aside the coals. I think such fish as those need no sauce save hunger, and I think, too, that trout so cooked—though eaten perforce without salt—would tempt the jaded appetite of a gastronome.

When all is said and done, quite the most important step to be taken toward any vacation is the step that leads away. Go, and godspeed! But keep a proper sense of the value of things, lest you mistake the incident for the event. I regard it as a serious error for anybody to assume that the chief reward of a vacation are tan and trout. You may return as bronzed as any Hottentot spearman, and with camera-recorded evidences of the fish you took or the wilderness you held to tribute. You may feel as confident and capable as Archimedes, who lacked only a proper fulcrum to move the world. These are among the fruits of vacation. Yet they do not constitute the real rewards of the red gods. When you hear them calling, you will be remembering sunsets and breezes, and rain on bracken, and the ceaseless giant whisper of the river, and divers trivial, precious matters much akin. Go then with assurance, for you will have heard the true promise and will be ready to answer.

FOOTPRINTS IN THE ROCKS OF AGES

By Charles W. Gilmore

It is a fascinating tale that is told by the buried rocks of ages long gone. It is a tale of strange prehistoric animals that roamed a different land than what we now see. This article by Mr. Gilmore, the Curator of Vertebrate Paleontology of the United States National Museum, is a prelude to a series of shorter articles about what is known of the animals themselves.

TELLTALE FOSSIL TRACKS

These show the prehistoric animal to have had a dragging tail.

THOSE of us who have been in the woods the morning after a fall of snow, or who have passed over a sandy flat or along a muddy shore, have often seen numerous tracks and trails made by the animal life of that particular locality. The same kind of records were made by animals now long extinct, and in many instances these footprints are the only evidence of their previous existence. Such are the footprints found on the surface of the rocks in various parts of the world, as in England, Germany, France, and the United States. In certain localities in the United States they have been found in an abundance and perfection of preservation that is unrivaled elsewhere.

The Connecticut River Valley in New England has been long famous for its fossil tracks. It was here that Pliny Moody, in 1802, ploughed up on his farm a rock showing small, three-toed imprints which later were popularly called the "tracks of Noah's raven." From time to time following this first discovery numerous other tracks were found, and for nearly a century these impressions were observed by the people of the valley. However, because many of them had the appearance of bird tracks, they were considered as such, and, to those unaware of their great antiquity, were undoubtedly of little interest. But, as soon as they became known to men who could appreciate their full significance, these impressions were recognized as being of great scientific interest.

It is said that from a few tracks and signs an Indian inferred that at noon there had passed by a white man, lame in the left foot, blind in the right eye, dressed in gray, and with a double-barreled gun and a black dog. With no attempt to rival such astuteness, scientists, by a study of these tracks and trails, have been able to learn much concerning the animals that made them. The development of their investigations, beginning more than half a century ago, has risen to the dignity of a science known as *Ichnology*. It is a science which, for convenience in classifying the tracks for future reference, requires that they be given scientific names, following the same practices applied to the naming of fossil animals from their skeletons.

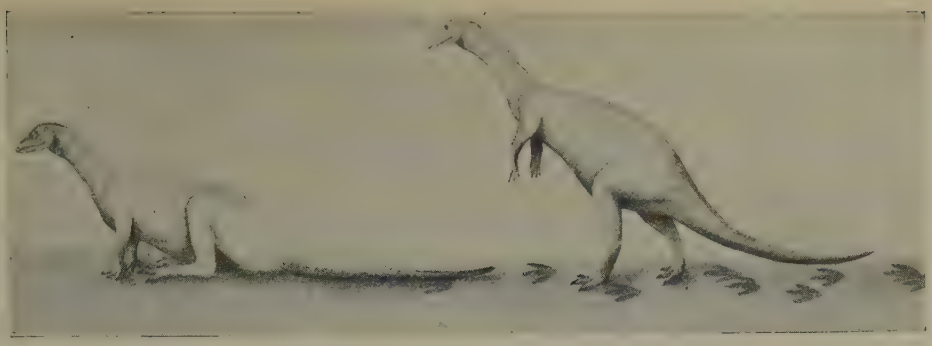
More than one hundred different kinds of tracks have been recognized in the rocks of the Connecticut Valley alone. So many of these were made by three-toed creatures that it was believed they were the tracks of birds. But the subsequent discovery in the same rocks of the fossil bones of a race of extinct reptiles known as dinosaurs, many of which were three-toed, pointed to their reptilian origin. This is the accepted explanation today, although a few are still doubtfully regarded as having

FOOTPRINTS OF PAST AGES

One of the tracks found in the Grand Canyon of the Colorado.

been made by some ancient birds.

For the benefit of those who may be unfamiliar with dinosaurs, it may be explained that, while the name dinosaur is popularly associated with a four-legged animal of great bulk and having a long tail and neck, there were many other kinds; and while it is true that some were the largest land animals the world has ever known, others living at the same time were very small. They differed greatly in shape, structure, and habits. Some walked on all four feet, while others, with small, weak fore limbs, walked upon strongly developed hind legs like ostriches. Some were provided with long, sharp claws; others had flattened, hooflike nails. Some were big and cumbersome; others, small, light, and graceful. Some were flesh eating, while others fed only upon plants.



BY THEIR TRACKS YE SHALL KNOW THEM
Reconstruction of what one of the prehistoric animals is believed to have looked like, according to the evidence of its footprints.

Judging from the abundance of their tracks, the three-toed forms, walking on the two hind legs, predominated in the Connecticut Valley. Far, far back in the distant past, during the period in the world's history known as the Triassic, the broad valley of the Connecticut was a tidal estuary that extended as far north as Turner's Falls in Massachusetts. One day when the tide was out, one of these now extinct reptiles walked along the beach, leaving his footprints in the sand. The tide came in bearing its burden of mud and sand which gently buried the tracks, and in the ages following, this sand was turned to stone, and in quarrying the stone the tracks were uncovered. Thus Nature preserved the record for the future.

The impressions, while mainly of footprints, also give evidence of dragging tails, claws, and other portions of the body. Other attendant phenomena have also left their records, such as the raindrops of a summer shower, ripple and other beach marks, and shrinkage cracks which are found in sun-dried mud. These are preserved with wonderful fidelity and minuteness of detail. In the United States National Museum there is a slab covered with raindrop impressions and crossed in different directions by the trails of two animals, one made before and one after such a shower, as is shown by the presence of raindrop impressions on the one and their absence on the other.

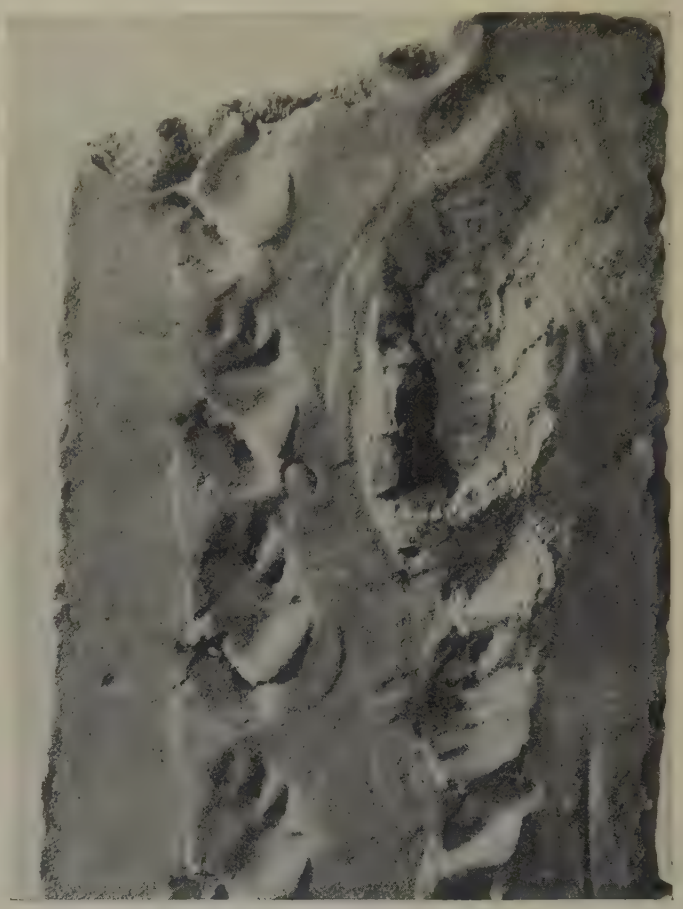
Professor R. S. Lull describes "one extremely interesting specimen in the Amherst collection which bears in all about fifty impressions, most of them made either by the same animal walking back and forth along the beach or by several of about the same size. In one of these journeys the creature slows down, as shown by the fact that the tail begins to drag, whereas before it had been held stiffly out behind, to counterbalance the weight of the body. Then the animal stops and comes down on all fours, impressing the little hands and long heels; then having satisfied his purpose, he again rises to his hind feet, touching one hand and the tail tip once more to the ground in regaining his balance, and then goes on his way. This single slab gives us thus a knowledge of the creature's size, proportions, gait, resting posture, feeding habits, for the little

ONE ANCIENT DAY THESE TWO TRAILS CROSSED
This fossil tells of two different animals of bygone ages whose footprints were left in the sands for time to turn into permanent records.

hand with its nailless claws could never have been used for grasping prey; and, finally, the texture of skin on the soles of the feet with creases between the joints like those of human fingers and tiny granulations like mustard-seed covering the entire surface." This slab gave the first recorded evidence of plant-eating dinosaurs in the Triassic, which some day will probably be verified by the finding of their bones.

Some of the tracks are of immense size, one found in Massachusetts being twenty inches in length, and the moderate depression made by the foot holds four quarts of water. Still larger footprints also of dinosaurian origin, with a length of thirty and a width of thirty-one inches, and a walking stride of nine feet four inches, have recently been found in the coal mines of Utah.

That our capital and its vicinity was once the stamping ground of the dinosaur is shown both by the finding of their fossilized bones and by the discovery a year or so ago, of numerous footprints near Leesburg, Virginia. In remodeling the old President Monroe home in Loudoun County, Mr. Littleton, the present owner, desirous of matching the flag-stones used in the porch floors, after some search located the quarry from which they had originally been obtained. Upon quarrying out some of the flags, he noted that their surfaces were covered with what appeared to be the footprints of animals. These were called to the attention of the authorities of the National Museum who pronounced them to be of dinosaurian origin and of the same geological age as those found in the Connecticut Valley. Mr. Littleton became so interested in these footprints that a special search was made for slabs containing well-preserved series of tracks, with the result that the floors of his enlarged porches are unique in being covered with fossil footprints, many of them in consecutive series, showing the course and stride of the creatures that had made them.



TRACKS OF A NEW GENUS AND SPECIES.
This Grand Canyon fossil also shows that a large footprint of some unidentified animal has blotted out part of the tracks on the right.

The great antiquity of some of these footprints is nowhere more clearly illustrated than in the Grand Canyon of the Colorado, in Arizona. In one place on the famous Hermit Trail, numerous footprints have been found in the Coconino sandstone about one thousand feet below the level of the present rim of the Canyon. In other words, since the time when those animals impressed their feet in what at that time was fine, moist sand, more than one thousand feet of rock-making materials were piled up in successive strata above them, and this does not take into account many hundreds of feet more that have been eroded off the present top of the canyon wall. The great length of time necessary for the cutting away or erosion of the rock to form the deep canyon, and the even longer time necessary for the original deposition of this great vertical mass of stone, is, when translated into terms of years as far as possible, so stupendous as to be almost beyond human comprehension.

The record is here so obvious and convincing as to the antiquity of the animal making the tracks that within the past few months the National Park Service has prepared an exhibit by the side of the trail by uncovering a considerable area of the track-covered rock surface in order that the passing tourist may have the benefit of the lesson taught. These Hermit Trail footprints occur in the Carboniferous geological age and are, therefore, much more ancient than the tracks previously mentioned. Dinosaurs were unknown at this time, and in fact, so far as geological records go, primitive amphibians and reptiles comprised the land vertebrate animal life of this period. There were many different kinds of these animals, which fact is clearly demonstrated by the finding of different kinds of tracks. Some of these creatures had five toes, some four; some had long, sharp claws, others toes apparently without claws. All appear to have been quadrupedal—that is, they walked or crawled on all four legs. They also varied extremely in both size and character. Some were no longer than a mouse, while others had a stride of two and one-half feet. At this time it seems extremely doubtful if a single one of these tracks can be definitely linked up with any of the animals of the same age known from their petrified skeletons, but ultimately, when more is known of both, such a hope may be realized. Many of the trails are beautifully distinct and the course of the animal may often be traced for a considerable distance.

In addition to these footprints there are trails evidently made by crab-like animals or insects, the imprints of their pointed toes in clusters of two and three with a distinct furrow between caused by the drag of a tail being clearly impressed. There are also burrows believed to have been made by worms. Various worms of the present day, such as the common lug worm, are known to form long, wandering, tortuous channels in the sands of the seashore.

More modern animals such as the mammoth horse, deer, wolf, and ground-sloth have also left their tracks impressed in rock formations of the Pleistocene geological period, an age just preceding the present. Footprints of extinct animals clearly uphold Emerson, who said that "everything in Nature is engaged in writing its own history."

HOW TO KNOW BIRD SONGS

By Aretas A. Saunders

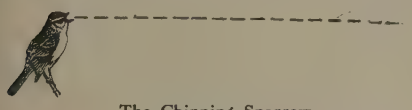
(illustrated by R. Bruce Horsfall)

IT IS one thing to name each bird that one sees clearly. It is another to name the bird that one hears. Yet, except in unusual cases, one may know birds as accurately by their songs as by their plumage. To identify a bird by its plumage we must see it clearly, in a good light, with no branches, leaves, or other obstructions in the way. To name a bird by its song none of these conditions is necessary.

Each species of bird has a song distinct from those of all others. By song alone the name of the bird may be known. But books do not describe songs accurately, or in such a way that one who has never heard a certain song will recognize it when he does. The accurate description of a bird song is difficult, and further complicated by the fact that in most species no two individuals sing exactly alike. Yet by careful analysis of details, we may learn the distinctive characters of each song, and fix them in our memories.

Bird songs vary in five different ways. To describe a song completely, we must consider all five. The song of each species is distinguished by peculiarities in one or more of these characters. The characters are time, pitch, loudness, quality and pronunciation.

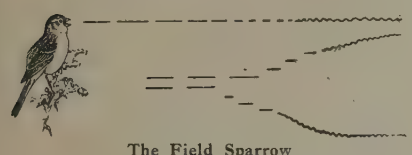
We may draw a diagram of a bird song on a paper, or in a field notebook by means of a series of lines, each line representing a single note of the song. In such a diagram the time factor is represented by the horizontal length of the lines.



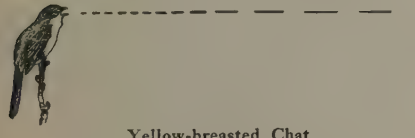
The Chipping Sparrow

The chipping sparrow sings a simple series of notes with perfectly even rhythm. A similar diagram might also represent the song of the junco and of some other species.

The field sparrow song represents the occasional song of this species that does not vary in pitch, and illustrates how the notes begin slowly and become faster and faster toward the end, till they are finally run together so closely that the ear cannot separate and count the notes. This last phenomenon may be represented by a wavy line. Such a sound is usually described in the literature of bird song as a trill, although it is in no sense the trill of the musician. The musician's trill is not common in bird music, so that I use the word "trill" to mean a bird trill such as is found in this song, representing it in diagrams with a wavy line. Variations of the field sparrow song often rise or fall in pitch toward the termination, the notes becoming faster in time and the song ending in a trill. Listen carefully and see whether you catch this.



The Field Sparrow

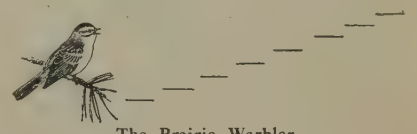


Yellow-breasted Chat

The yellow-breasted chat often sings a series of low whistles, the time arrangement of which is the opposite of the field sparrow record, becoming slower and slower toward the end.

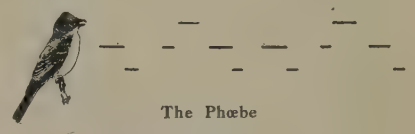
The Chickadee

Changes in pitch in a bird song may be represented in diagrams by the vertical position of the lines. The simple "phoebe" whistle of the chickadee represents this, the second note being about a tone lower than the first.

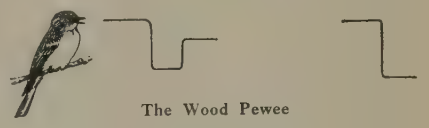


The Prairie Warbler

The song of the prairie warbler consists of a series of notes, even in time, but rising in pitch. A simple combination of pitch and time factors may be noted in the phoebe song, the bird singing short two-note phrases, "phoebe" falling in pitch, or "peerit" rising in pitch, with short pauses between the phrases.

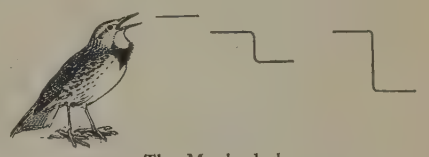


The Phœbe

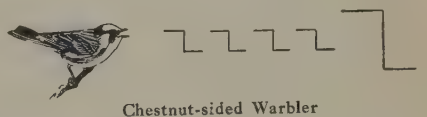


The Wood Pewee

We may represent the form of diagrams the way in which two notes of different pitch are joined together. Sometimes one note is slurred into the next as in the long-drawn-out, three note song of the wood pewee or in the "spring o' the year" song of the Meadowlark, one of the many variations of which is represented with the little figure of this beautiful songster.



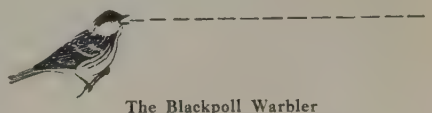
The Meadowlark



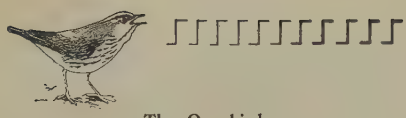
Chestnut-sided Warbler

Sometimes two notes are joined together but not slurred. This may be represented as in the diagram of the chestnut-sided warbler song, the song that supposedly goes "Very very very pleased to meetcha." Again two notes are distinctly not joined together, though following each other without pause in time. This is represented in the first two notes of the "Drink your tea" song of the happy towhee.

The Towhee



The Blackpoll Warbler

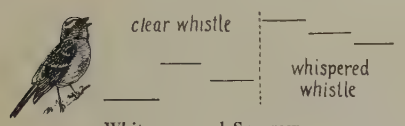


The Ovenbird

Loudness often varies in different parts of a bird song. This is easily represented by making the lines for the loud notes heavier than the others. This is quite simply shown in the song of the blackpoll warbler, a song one of the characteristics of which is a crescendo toward the middle and a diminuendo toward the end. The way in which the loudness of the so-called "teacher" song of the ovenbird increases toward the end is easily represented, while the loud, accented note at the beginning of each "witchery" in the commonest form of the Maryland yellowthroat's song, is shown by the heavy lines at regular intervals.

Maryland Yellow-throat

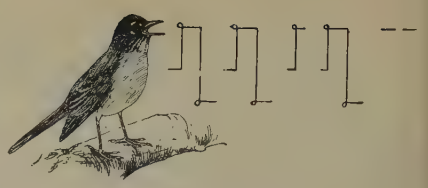
Quality is a more difficult factor to represent. In some of the more complicated singers, quality is the most important character of the song. There seems no better way to record it than by descriptive words, or phrases such as "buzz-like sound," "clear whistle," "flute-like notes" and others. In most songs the quality is the same throughout, but in a few there is variation. One song which seems always to show a change in quality is that of the white-crowned sparrow.



White-crowned Sparrow

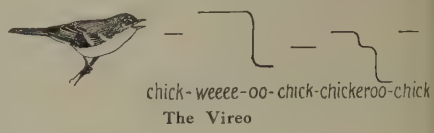
Pronunciation is a factor that is not always easily made out. In some species it is an important and characteristic factor. In literature many bird songs have been described merely by stating what the bird seemed to say. Sometimes the bird was supposed to speak English words such as "spring o' the year" for the meadowlark, or "Old Sam Peabody" for the white-throated sparrow. In other cases, phrases that the bird actually seemed to say, such as "conqueree" for the red-winged blackbird, or "chebec" of the least flycatcher, have been used with better success. These latter are in most cases more like the real song than the English words, for they rely more upon the true sound made by the birds and less on the imagination of the observer.

When we come to analyze pronunciation in bird songs, we find that vowel sounds are really a matter of imagination. A musical note has no vowel sound, but the effect of high and low pitches is much like the difference in the broadness of a vowel sound. Therefore, when we fit phrases to a bird song, if we make the high-pitched sounds "ee" or "ay" and the lower ones "ah" or "oo," we will come near to representing the sound of the song to our ears.

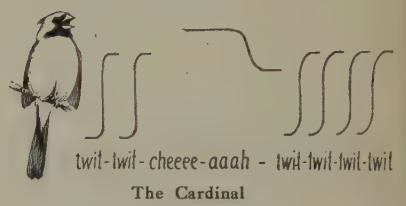


The Robin

Consonant sounds are numerous in some bird songs. In many of the most beautiful songs, a liquid consonant sound, like the letters l or r is common, often connecting the different notes. This sound is so frequent that I represent its presence in a song by a loop between the notes, as shown in the robin record. Other consonant sounds, such as t, ch, w, p and others, are common and characteristic in certain songs. Songs of the white-eyed vireo, the cardinal and the water thrushes abound in them. In such songs I find it most useful to represent the pronunciation factor by writing beneath the record the phrases that the bird seems to say, as in the records of the white-eyed vireo and cardinal. One should be careful in recording this factor to listen carefully for real pronunciation sounds in the bird song, and not to use the imagination to supply them.



The Vireo



The Cardinal

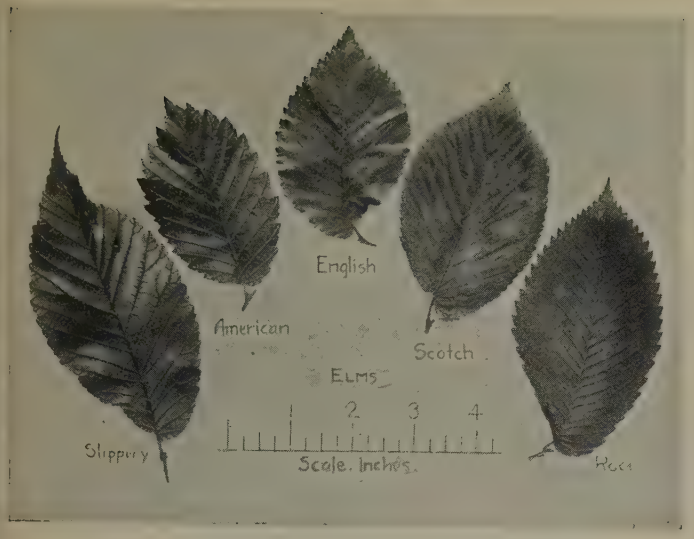
Thus all five of the factors of bird song may be recorded in a note book, and one may soon come to learn which factors are characteristic for each species. I find it most convenient to use in the field a loose-leaf note book, with quadrille-ruled paper. By making the space between two horizontal lines stand for a half-tone in pitch, and the spaces between vertical lines for equal intervals of time, one may make records that are extremely accurate, and that may have scientific value. Whether one wishes to do this, or merely to know bird songs for his own pleasure, he will find an analysis of song along these lines extremely helpful in learning the birds at hand.

The Kangaroo Rat

THE KANGAROO RAT is neither a kangaroo nor a rat although it has characteristics of both. Like the kangaroo it has a long tail, weak fore legs, long hind legs, and a pouch which consists of two membranous cheek sacks, used for carrying food and earth. The breast and under parts are immaculate white, and the head triangular in shape with large, prominent eyes.

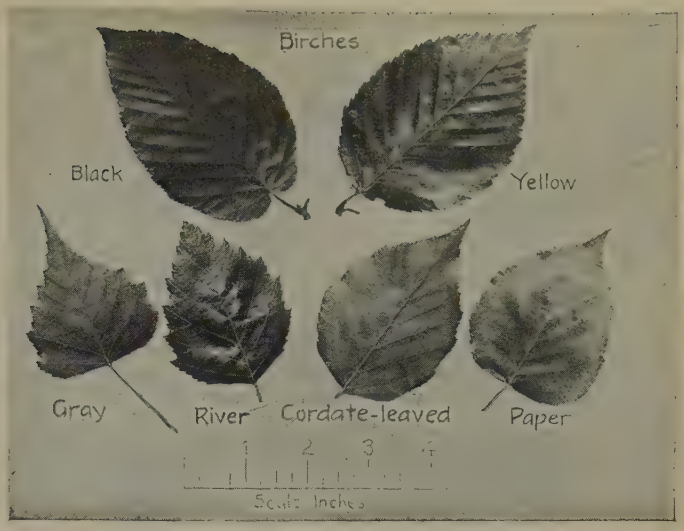
The young are usually two in number, born any time. In a natural state they are pugnacious, fighting among themselves and with small animals; however, they make interesting pets, rarely offering to bite. They fight by leaping into the air and striking downward with their powerful legs.

Unlike most rodents, kangaroo rats do not hibernate, but lay up stores of food in the burrow for use during stormy weather. The food of leaves and seeds is gathered in the spring during April and May, and in the fall from September to November. Like desert rodents, mice and ground squirrels, they do not drink water, but obtain it through their digestive processes from moist foods.



ELM LEAF MARGINS ARE CLOSELY NOTCHED

The leaf of the white elm is the most deeply cut of them all, however.



THE VEINS OF THE BIRCH ARE SET IN

They appear as grooves on the upper side and stand out only on the back.

TREE LEAVES—THEIR STORY

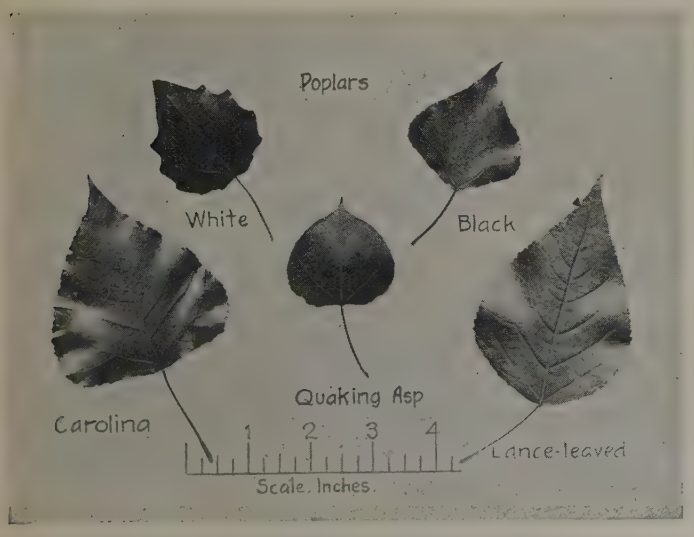
By MARY F. ROBINSON

(PHOTOGRAPHS BY CHARLES W. ROBINSON)

TREE LEAVES manufacture tree food. To the life of a tree, they are indispensable. Within them food-making processes go on continuously day and night throughout the growing season, but their fundamental work is done with the aid of sunlight.

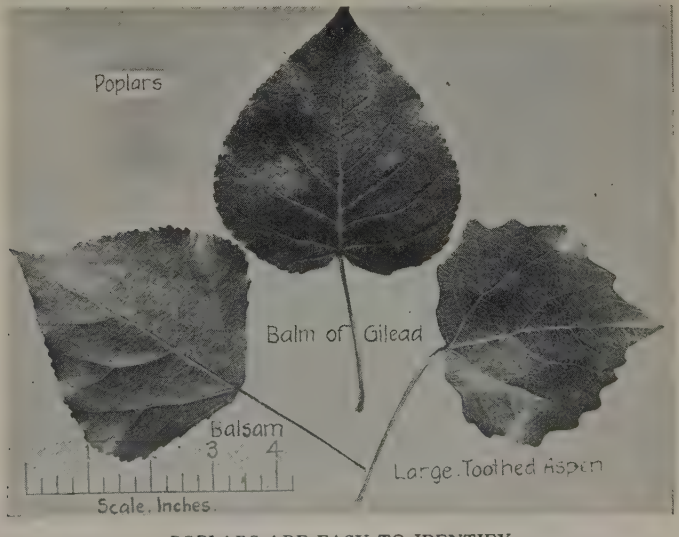
Trees require the same classes of foods as human beings—starches, sugars, proteids, and mineral salts. Unlike human beings, they can manufacture these foods from elements obtained from atmosphere and soil. To understand how the leaves get the materials and make the food, we should know something of their structure. Each leaf is made up of a series of layers. The upper and lower surfaces consist of thin layers of cells forming the epidermis, or skin, of the leaf. This skin encloses the entire leaf and stem and forms a waterproof and airproof outer covering in which are innumerable slit-like apertures, too small to be seen even with the magnifying glass, through which air may pass in and unused elements of the air and moisture may pass out. These apertures open and close automatically in accordance with the needs of the leaf.

Between the upper and lower surfaces are two layers of cells interspaced by air passages which communicate with the breathing slits. Within these cells rounded green bodies absorb energy from the sunlight under the influence of which elements of water brought from the roots unite with carbon dioxide of the air to make the principal plant food, starch. Dissolved starch chemically combines with elements of the raw materials, including mineral salts obtained from the soil by the roots and transferred in solution to the leaves, forming other foods. Veins, corresponding to the veins and



POPLARS HAVE THREE PROMINENT VEINS

These radiate from a point close to the junction of the stem and the leaf.

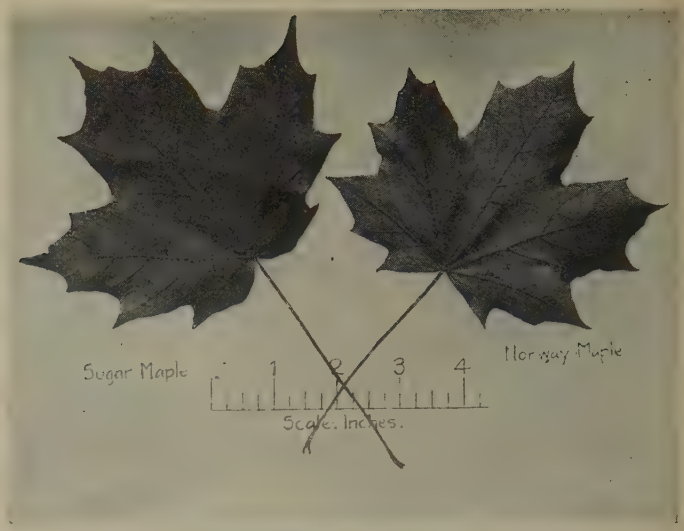


POPLARS ARE EASY TO IDENTIFY

We know them by their firm, soft, leathery texture, and scalloped edges.

MAPLE LEAVES HAVE PROMINENT LOBES

The veins, except for the box elder, radiate from the stem and leaf joint.



TWO DIFFERING MAPLE LEAVES

The sugar maple is three-veined, while the Norway maple is five-veined.

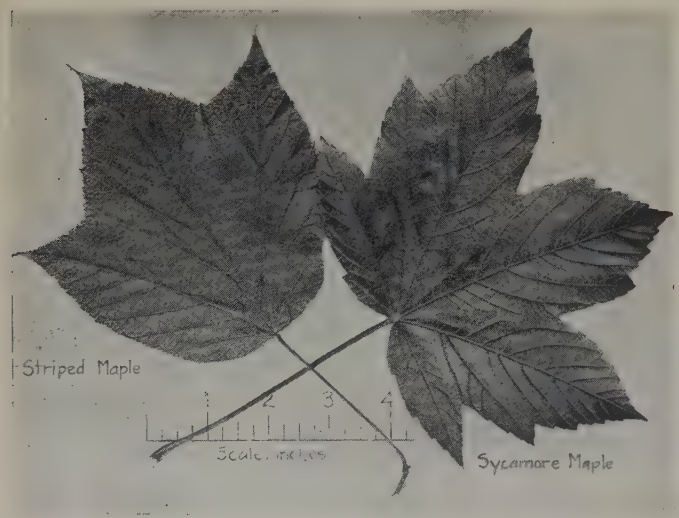
arteries of the human system, ramify throughout the leaf bringing to every part water laden with food elements from the roots, and carrying away from the leaf back to stem, trunk and root, manufactured plant foods to be used either in the growth of the tree or stored up as reserve material for the nourishment of next year's buds.

Because the fundamental plant food, starch, cannot be manufactured without light, proper exposure of the leaf to the light is extremely important, and the mode of growth of the tree is so governed as to provide this exposure. Each tree grows in accordance with its own definite plan. Branches have a definite placing and direction; leaves not only originate in definite places along the stem, one or two at a node, or in whorles around the stem, but they also grow outward from the stem at nearly uniform angles with the horizontal; and nodes are always far enough apart so that the leaves at one node do not shade those at another. Leaves do not grow except in the lighted outside portion of the tree. It may be noticed how bare a large fallen branch looks with leaves only on the outside small twigs.

Since there is a definite method of branching, a definite placing of leaves along the stem for the ultimate purpose of bringing all leaves into the light, it would seem that leaves have a definite shape, depending upon the spaces that are allowed to fill when growing toward the light. Their largest veins radiate from the base of the leaf or branch from the main rib to form a framework to hold the leaf layers to the light. And although there is a great variety of leaf forms, yet for each leaf it may be said that its form is nicely suited to its position on the stem and the habit of growth of the tree.

Arrangement of the prominent veins and the form of a full grown leaf will usually identify the leaf as that of an oak, elm, maple, beech, birch, or ash. For more accurate identification of even the common trees other leaf characteristics have to be considered. Texture—which we learn by repeated handling, not by description—lustre, smoothness or hairiness of the leaf, thickness, margin, sometimes the difference in color between the upper and lower surfaces, sometimes the leaf stem which may be cylindrical, grooved, or flattened; these we gradually learn from many observations.

Elm, beech, and birch leaves have similar arrangements of veins. All have very prominent midribs with side veins



TWO MORE OF THE MAPLES

The striped is like the red though larger, and the sycamore is the coarsest.

OAK LEAVES HAVE A PROMINENT MIDRIB

Those belonging to the white oak group are coarser and rougher on the back.

TWO OF THE BLACK OAK GROUP

All of this group have bristles on the points of the lobes of the leaves.

ANOTHER DIFFERENCE IN OAKS

Note that the red oak leaf has more lobes than has its neighbor the black.

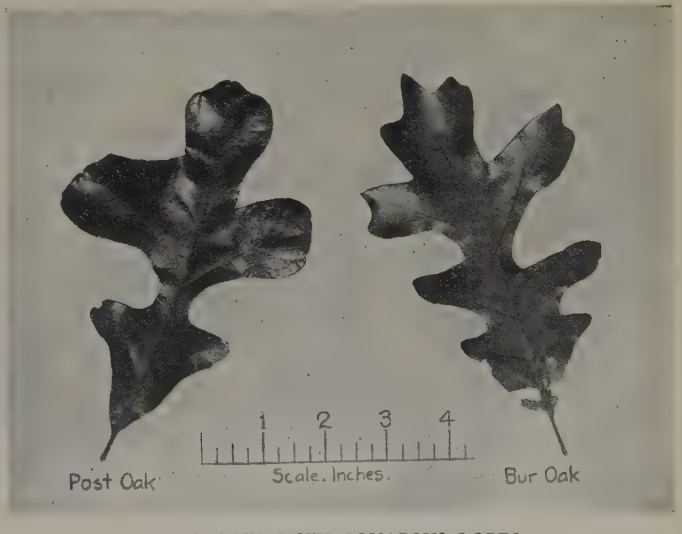
running parallel to each other to the edges of the leaves. They differ in shape, however, for elm leaves are always lopsided at the base, beech leaves are pointed at both ends, and those of the birches have their broadest part nearer the base. They differ also in texture. Elm leaves are coarse; those of the beeches are papery; birch leaves are soft, thin, and more delicate. The leaves of the common beeches have simple margins with single small teeth far apart.

All elm leaves have margins closely notched, each tooth having still finer teeth on its own margin; the white elm leaf is the most deeply cut. If a white elm leaf is held curved over the finger and viewed across the leaf surface with a magnifying glass, hairs show plainly on the lower surface, and bristles usually on the upper surface if the leaf is old. These short stiff bristles on the upper surface feel smooth when stroked toward the tip but rough when stroked toward the stem. Both surfaces of the white elm leaf are dull. The slippery elm leaf is thickly covered on its upper surface with tiny stiff bristles so arranged that the leaf is rough when rubbed in any direction. By this alone the leaf can be easily recognized. The entire under surface is hairy; the notches are very shallow; the point is long and tapering; and the leaf has the characteristic slippery elm bark odor. The Scotch elm leaves are a waxy or dull dark green; their bristles on the upper surface are very short; their lower surface is covered with fine hairs. On most Scotch elms are some leaves which have shoulder-like projections or undeveloped lobes on either side of the point. The leaves of the rock elm are always smooth above. When held toward the light, the soft fine hairs of the lower surface look silvery under the magnifying glass. Even from a distance the shiny rounder leaves of the English elm are conspicuous. This leaf is fairly smooth when rubbed away from the midrib but rough when rubbed toward it.

The veins of birch leaves are set in so that they appear as grooves on the upper side and stand out only on the back; those of the black, river, and yellow birch leaves are rounded and prominent, while gray and paper birch leaf veins are less conspicuous. River birch leaf veins are the hairiest; those of the gray birch leaf are dotted with black, and of the paper birch leaf, tufted with wool at the angles between the midvein and the side veins. The gray is the only one with a long tapering point and a long slender twisted stem. The river birch leaf is the shiniest and most deeply notched of all.

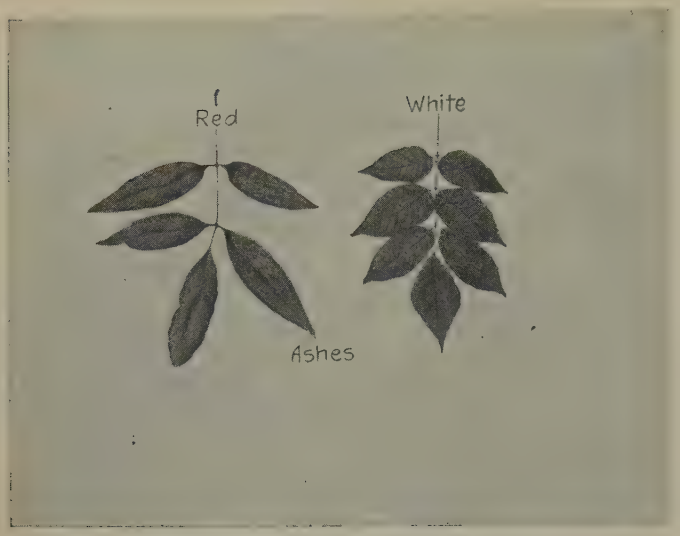
THE WHITE OAK IS DISTINCTIVE

We know it by the round and sometimes mitten-shaped lobes of the leaves.



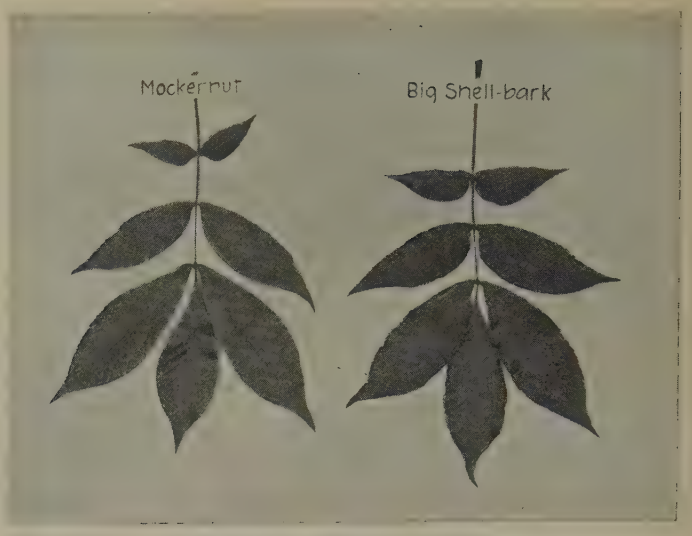
TWO OAKS WITH SQUARISH LOBES

The leaf of the bur oak is long, often with two deep interlobe spaces.



ASH LEAFLETS ARE FINE IN TEXTURE

Often they are found to be about the same size and the same shape.



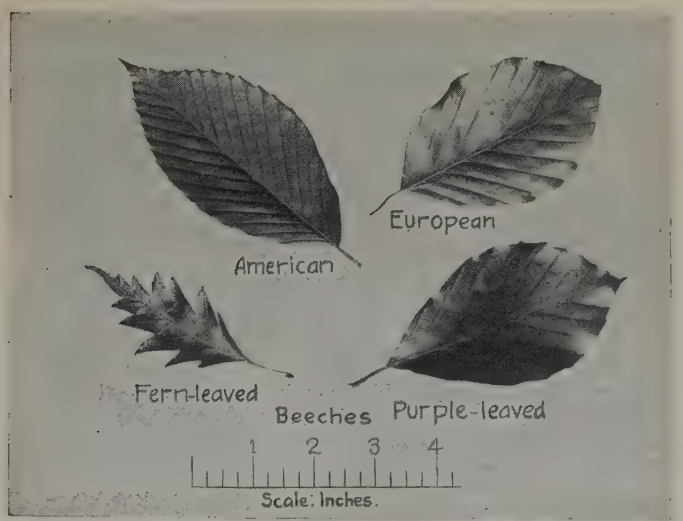
HICKORIES ARE THICK AND FIRM

The terminal leaflet only has a stem, others being attached to the main stalk.

In the woods from a short distance sweet or black birch leaves resemble those of elms, but close to the sweet birch leaves, though slightly lopsided, are thin and delicate in texture, and what is more noticeable, perhaps, they grow in pairs, while elm leaves grow only one at a node.

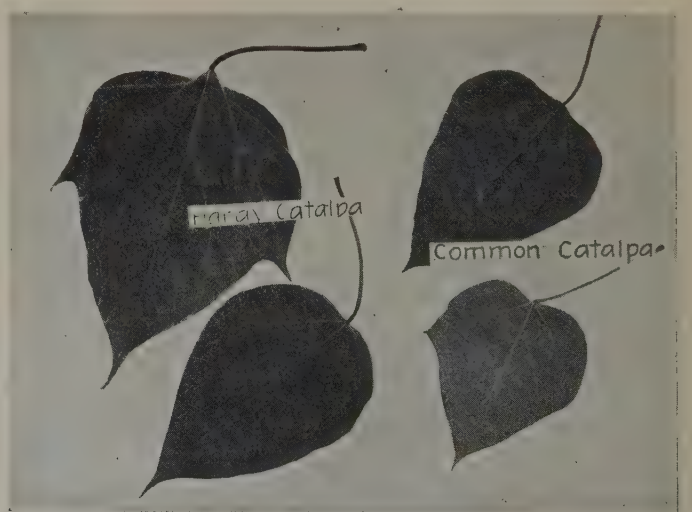
Poplar leaves have three very prominent veins that radiate from a point close to the junction of stem and leaf. No other common tree leaves without prominent lobes are three-veined except those of the catalpas. We learn to know the poplar leaves by their firm, soft leathery texture, their scalloped edges, and flattened stems. The catalpa leaves, which are larger than any of those of the poplars, we admire for their beautiful satiny luster, and their soft smooth tops and downy under surfaces make them pleasing to handle.

Maple and most of the oak leaves have prominent lobes. These two kinds differ in their modes of veining, their textures when once learned help to distinguish them, and the maple leaves are much longer stemmed. The veins of all maple leaves except those of the box elder radiate from the stem where it joins the leaf, each lobe having a prominent vein which extends to its tip. Red, silver, sugar, and striped maple leaves are three-veined; Norway and sycamore are five-veined. The deeply cut silver maple leaf has its distinctive characteristics—long, slender, sharply pointed lobes, silvery white back, white veins, and thin, fine texture. The red maples, which in the autumn make the swamps "glow like a sunset sea," have two types of leaves neither of which are deeply cut. The three main veins are tinted with red, the under side is woolly along the veins, and the leaf is a little thicker than that of the silver maple. The striped maple leaf resembles in shape one type of red maple leaf but is much larger; it has so soft a texture that there is no stiffness to the leaf; and there are no hairs on either of its sides. The sugar maple leaf is easily confused with the Norway, but, with care, we may distinguish the two by counting the prominent radiating veins. The sugar maple leaf is thinner and lighter green in color; its points are longer and more blunt. The leaf of the sycamore maple is the coarsest and thickest of all; it is very dark green and the branching veinlets show plainly on the upper side. Should we imagine the three separate box elder leaflets grown together, the result would be a three-veined leaf like that of the red maple. The box elder leaf is the hairiest of all, this character making its identification easy.



THE BEECHES ATTRACT ATTENTION

Here we have four differing leaves of this group of interesting trees.



WE ADMIRE THE CATALPA

Their lustre is of satin and their under surfaces are covered with down.

Each of the oak leaves has one very prominent midrib with prominent side branches which extend the entire length of each lobe. Most of them are of hard leathery texture. Those belonging to trees in the white oak group (white, post, bur, yellow, overcup, swamp white, and chestnut oak) are coarser and rougher on the back than those which belong to trees of the black oak group (black, red, scarlet, pin, shingle, and bear). All leaves belonging to black oak group trees have bristles on the points of their lobes. The red oak leaf has more lobes than that of the black oak; the leaf of the scarlet oak has deeper and more rounded spaces between the lobes than that of the black oak; the pin oak has deep, rounded interlobe spaces like that of the scarlet, but the leaf is smaller, the lobes are narrower, and have fewer points; one type of black oak leaf has three broad lobes at the top, the other has the same general shape with very shallow interlobe spaces. We know the white oak leaf by its rounded and sometimes mitten-shaped lobes. The very coarse, tough oak leaf with two squarish lobes belongs to the post oak. The leaf of the bur oak is long, often with two opposite interlobe spaces so deep that the leaf is nearly divided into two parts, the upper being the larger.

A compound leaf is one with a group of leaflets attached to one stem. The most common trees in the New England woods having this type of leaf are the ashes and our common nut trees, the hickories. Each leaflet of the ash has its own short stem, while the terminal leaflet only of a hickory leaf has a stem, the others are attached directly to the main leafstalk. Most of the hickory leaves are thick, firm, and sometimes rough; the terminal leaflet and the first pair below it are alike in shape and size; the other pairs are smaller, each succeeding pair toward the base of the leafstalk being smaller than the one just above it. The ash leaflets are finer in texture and often are all about the same size and shape.

On our summer walks, by close observation of these leaf characteristics we learn to name and to know as friends most of our woodland trees and those that furnish shade along the city streets. We admire the beauty and variety of leaf forms. We deeply regret the ravaging work of insects which sometimes strip trees of both crops of leaves, all that they are able to produce during one season, and leave the trees to die. From the unfolding of the leaves in the buds to the time they fall, there is one long succession of beauty in color, the soft downy delicate tints in spring, the restful shades of green for the bright summer days, the gorgeous sunset colors at the close of the growing season marking the end of a useful life. As a final act of supreme self-sacrifice, in countless numbers they fall to prevent loss of moisture from the trees during the winter. In the course of time bacteria bring about their decay, and they return to the soil.

Spittle Insects

By Edward A. Preble

THOSE of us who were country boys will remember that when we walked barefoot in the grassy fields we often brushed from the grass small masses of frothy, sticky stuff that seemed to have grown there overnight. Some of the old people told us fanciful tales of its origin and, of course, that it was poison. But none of us suffered or died from it, and some of us investigated and found in the damp midst of the froth a few small, dark insects. And I sometimes think that it is perfectly natural for young people to be sceptical of what old people tell them, for they surely did tell, and perhaps believed themselves, some awful whoppers.

The insects which make these frothy spots are called frog-hoppers from their shape and gait. They are grayish or brownish in color and lay their eggs in autumn. When these hatch in the spring the young insects excrete a clear watery liquid which they are able to beat into the frothy mass we see by switching their bodies violently about. Here they live while growing up. The use of this viscid mass is still a mystery. Some suppose it to be a protection from enemies, but several species of birds have learned to find the inhabitants of the queer house. Certain wasps of that class which provide their expected young with provisions to give them a start in life, find the young spittle-makers excellent provender. But in spite of bird and wasp the race of froth-beaters persists, and still the boys find the meadows thickly spotted with these mysterious dwellings.

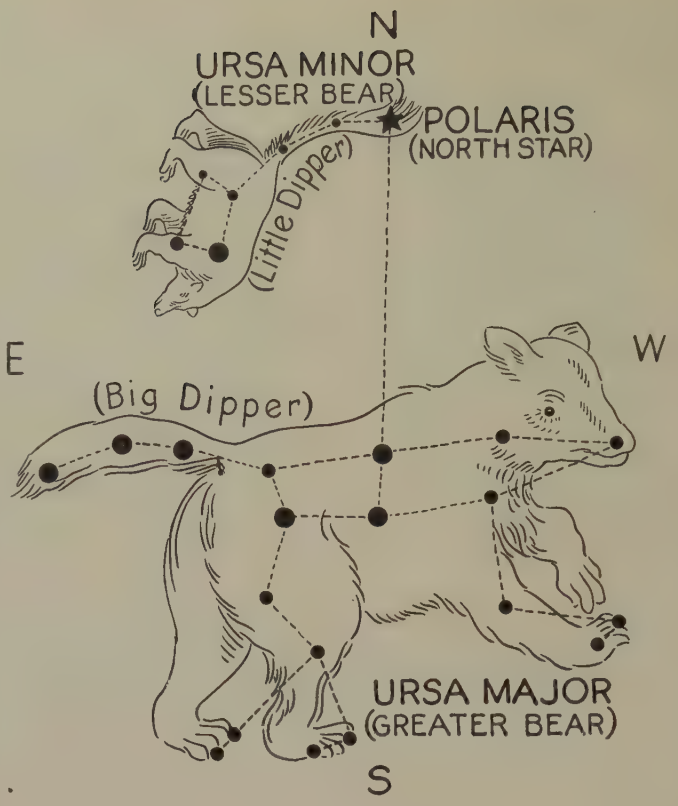
PHOTOGRAPH P. G. HOWES

DO YOU RECOGNIZE THIS?

All have seen the froth made by the spittle bugs in the long grass in spring.

Besides the spittle insects, a host of delightful mysteries were presented for our solving. In the muddy brook down in the meadow grew the pointed leaves of the pickerel weed, and about its blue flowers darted an olive and brown creature. This we were told was a young hummingbird, but we soon decided that it was an insect, though it was afterwards that we learned that entomologists had named it the hummingbird moth.

Summer begins this month with many interesting events taking place in the evening skies of June



To the left are pictured the Two Bears, Ursa Major and Ursa Minor, one June constellation

THE SKIES IN JUNE

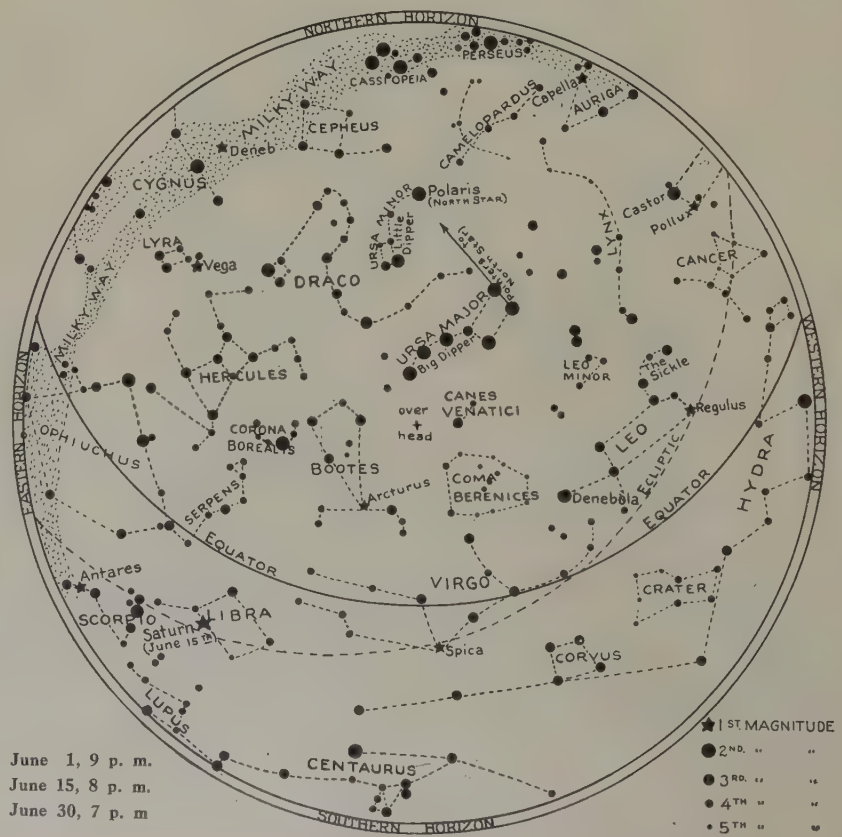
By Isabel M. Lewis

THE SEVEN bright stars that outline the well-known Big Dipper also form the tail and back of Ursa Major, The Greater Bear. Other fairly bright stars to the west and south mark the head, forefeet and haunches. The entire constellation covers a large area in the northern sky and is one of the best known star groups in the heavens.

The two stars in the bowl of the Big Dipper opposite the handle are popularly known as The Pointers because a line drawn through them and extended upward brings one to the North Star, Polaris, close to the north pole of the heavens. Facing this star, one is facing due north with east to the right hand and west to the left. The North Star also lies at the end of the handle of the Little Dipper, which occupies the same position in the constellation of Ursa Minor, The Lesser Bear, that the Big Dipper does in Ursa Major. The Little Dipper is by no means as universally known as the Big Dipper, for the stars that outline it are, on the whole, far less conspicuous than those of the Big Dipper.

The Greater Bear was also known as The Wain as far back as the days of Homer. The Romans often spoke of it as The Plow, which was supposed to be drawn by three oxen represented by the stars in the handle of our Big Dipper, though Cicero refers to the seven stars of the Big Dipper as the Seven Plough-Oxen. The Plow and The Wain are still popular names for this group of stars in England, as well as Charles' Wain, a name originally given to it in honor of the French king, Charlemagne, but later used with reference to the English kings, Charles I and Charles II.

The American Indians generally saw in this constellation a bear chased by a hunter and his dogs which were the three stars in the tail of Ursa Major, for no Indian would be guilty of picturing a bear with the absurdly long tail depicted so universally in the early star maps which showed evidently that their originators had little knowledge of the anatomy of a bear. To explain the abnormal length of the tail of Ursa Major one early English writer suggested that the bear must have been originally raised to heaven by means of his tail, and as his weight was great and the distance long it became sadly stretched



TO USE HOLD OVER THE HEAD WITH TOP TOWARD THE NORTH

by the time he reached his celestial abode. The tail of the Lesser Bear, as one story has it, owes its unusual length to the fact that for many, many centuries he has been swinging around the north pole once in every twenty-four hours by the end of his tail, a motion which might be expected to have a marked effect upon its length.

A keen eye will readily see close to the star Mizar, at the bend in the handle of the Big Dipper, a faint star of the fourth magnitude. This is Alcor, which is Arabic for The Test, and it forms with Mizar a wide, double star. The ability to separate these two stars was a test of good eyesight among the Arabs, hence its name. These two stars are also popularly known as The Horse and his Rider. Jack on the Middle Horse, and, in Germany, Hans, The Wagoner, are also popular names for Alcor, and in Italy it is called The Little Starry Horseman. The Pawnee Indians, who saw in the four stars in the bowl of the Big Dipper a stretcher upon which a sick man was being carried, called the first star in the handle The Medicine Man, while Alcor was known to them as The Medicine Man's Wife's Dog!

The Housatonic Indians who roamed through the valley of The Berkshires in Massachusetts had it that the chase of this bear of the northern heavens lasted from spring to fall, when he was wounded and his blood crimsoned the foliage of the forests.

In our northern latitudes the two bears belong to the circumpolar constellations that never set but swing once around the pole every twenty-four hours without dipping below the horizon. Ursa Major is seen to the best advantage, though, when it swings high above the pole, which occurs in the evening hours in spring and summer. Ursa Minor, being farther north, may be seen equally well at all times of year and all hours of the night in our mid-northern latitudes.

Among the most interesting constellations in view in the evening hours this month are Leo, high in the western sky, the large zodiacal constellation of Virgo, on the meridian due south, and Boötes, The Herdsman, directly east of the meridian. Virgo will be readily identified by its characteristic Y-shaped configuration of stars and by its white first magnitude star Spica, while Boötes will be recognized by the kite-shaped grouping of its principal stars with the glorious, reddish-yellow Arcturus at the base of the kite. One should not overlook, close to Boötes on the east, that exquisite little semicircle of stars known as Corona Borealis, The Northern Crown. The second magnitude star which represents the gem in the crown is known by the name of Gemma or Alphacca. The magnificent Vega, in all its diamond-like splendor, is also conspicuously in view by this time in the northeastern sky.

Summer begins this month when the sun reaches its greatest distance north of the equator in the constellation of Gemini on June 21st at 11:30 P. M. Eastern Time. Daylight then has its greatest duration.

Among the planets Saturn alone will be found in the evening sky. It is now in the constellation of Libra and will be seen in the southeast immediately after sunset. It is yellowish in color and nearly equal to Vega and Arcturus in brightness. Venus still continues to be a fine morning star. It is slowly decreasing in brightness but, as always surpasses all other planets and stars in brightness. Jupiter, now the brightest of the planets next to Venus, is also a fine morning star this month, in the southeast in Aquarius. It will remain nearly stationary in position throughout the month. Mars is now in fine position for observation in the early morning sky, rising nearly four hours before the sun. Its distance from the earth decreases from 108,000,000 miles on June 1, to 91,700,000 miles on June 30, and it increases noticeably in brightness during the month. By the end of June it will surpass Vega in brightness and by the end of the summer will rival Sirius in brilliance.

THE OLD APPLE TREE

NOBLE CENTENARIAN

ITS ROOTS are the roots of a pioneer. Its trunk and limbs have seen the passing of a century; the growth of a new country. It has borne fruit sturdily and well, and bears it still. It is The Old Apple Tree, whose seed was laid in the rich soil of the northwest one hundred years ago.

A century ago came the men of the Hudson Bay Colony from far off England. One of them brought an apple seed and it was planted within what is now Vancouver Barracks at Vancouver, Washington. When the tree was about ten years old, Mrs. Marcus Whitman, a pioneer missionary, enshrined it in romantic verse. She tells of the banqueting of the men of the Colony, to one of whom his sweetheart gave some apple seeds. She bade him plant them "on far Columbia's shores" in token of his love. This he did, according to the verse, and there is no doubt that, whatever the cause of the planting, many of the trees of the northwest can trace their ancestry to this original tree.

The Old Apple Tree, pictured here, still blooms and bears. It is marked by a sign telling of its origin. The Vancouver Chamber of Commerce, through its secretary, C. C. Hutchins, has been active in seeing that the tree shall have its just due. This year's fruiting is to be preserved by that organization and by the Great Northern Railroad. Special observances will take place during the year in connection with the running of the Columbia River Historical Train over the Great Northern, stopping at the site of the tree for historical talks. This dauntless tree could doubtless give an instructive talk also, had it the power of speech, because it has seen the years of empire building that evolved our western country.

Some Interesting Things to Look for in June

E. Laurence Palmer

(illustrated by garnet jex)

IF THERE is any month in the year when the home life of many of our common forms of wild life may be studied to better advantage than in June, I don't know which one it would be. To be sure, birds and mammals and other creatures "keep house" during other months than June. In June, however, everything seems to be a bustle: the birds have to hustle food not only into their own throats but into the throats of their young. Many wild mammals have to begin to show their young not only how they can get food for themselves but how they can avoid themselves becoming food for others. A sort of sense of responsibility seems to have settled on many of the creatures that a few weeks ago were hurrying about in a more or less unorganized manner. Later in the season this serious responsibility will have given way to a sort of resignation due to many things, among which may be pure exhaustion. The heat of the summer may not have become burdensome by June, if it has come at all. There may still be touches of spring in early June which make the pessimist say not "What is so rare as a day in June?" but "What is so raw as a day in June?"

Birds that are normally as wary as wary can be may in June seem to be practically fearless, particularly in the vicinity of their young at about the time the young are ready to leave the nest. It is at such time that amateur Nature photographers have real luck. A camera focused on a stick or stone near a nest where a parent bird has been seen to perch repeatedly before going to the young ought to produce a prized picture much more easily than the same camera focused on the same stick at some other time of year. If there seems to be a superabundance of convenient perches near the nest, a few may be removed to induce the bird to alight where it is desired. You will find, if you begin to work with birds in this manner, that many of them are, like human beings, creatures of habit. They may come to the nest by more or less definite pathways. They may consistently stop at a given place before going to the young, and certainly they seem to have more or less definite hours of work and rest, though most of the day is a work day for them when the young are growing rapidly. For the fun of the thing, see if you can't learn the routine followed by some individual bird in caring for its young. Don't expect too much of them, to be sure, but you may be surprised that there is even as much as there is.

During June many of the young birds will be leaving the nest and beginning to shift for themselves. Some young seem to persist in "working their parents" as long as this is possible, much as is the case in some human families. One of the interesting things in this connection is to be seen in connection with a young cowbird and its foster parent. Not infrequently you may see a good-sized cowbird being cared for by a diminutive chipping sparrow, a redstart, a vireo, or some other small bird. When you know that the cowbird has probably crowded out or starved out the rightful offspring of the foster parent your sympathies for once are not with the youngster. Do you find these young cowbirds ever being fed by other cowbirds?

Cowbirds are not so valuable as many of their foster parents because of the fact that they may, as adults, eat considerable grain, while the adult foster parents are almost invariably insect eaters. Among the insects that may be eaten by an adult chipping sparrow are the little plant-lice which are so frequently too abundant. If you wish to find out why they may be so abundant, place one on a twig which you can keep green and healthy in water in the house. In addition to noticing the peculiar habits of your pet plant-louse you may find that it may give birth to living young and continue doing this for some time. If you find a louse giving birth to its young, find out how many young it may produce in a two-day period. This may help you understand why plant-lice may become so abundant. It is not necessary that the louse producing young mate repeatedly with a male. See if you can find whether it is necessary for any of her immediate offspring to mate before giving birth to young. To do this rear a few of them on separate twigs in the house. Is it necessary that a plant-louse feed upon the plant on which you found it or will it vary its diet and eat practically any plant juice? You can easily find this out for yourself, if you will take the time. All that you find in this way will help you really appreciate the work of such birds as those chipping sparrows that you saw feeding the young cowbirds.

One of the questions that has been asked me repeatedly by children concerns itself with something you may see in June. Not infrequently cherries are at their best in this month, and not infrequently they are populated with the larva of some insect. This larva has neither wings nor well-developed legs; in fact it may have no legs at all, yet you find it hung high in a cherry tree on a fruit that is swinging freely in the breezes. The puzzle is to figure out how a legless, wingless creature got into such a place. How was it?

It may interest you in June to look carefully at a few of your old friends,

the woody plants, to find out whether they are making any preparation for next year. See if you can find any buds of woody plants for use in the spring of 1927 on the twigs in June, 1926. If they don't appear in June, watch and see who of your crowd of Nature lovers can be the first one to show a 1927 bud, that is, a bud which will open in 1927.

You may also be interested to find out whether such woody plants as maples and elms increase the length of their twigs as much during the last week in June as they did during the first week of that month. In other words, do they observe a budget system and say that they will do so much growing this year and be satisfied with that, or do they do all the growing they can while the growing is good? Does this rule hold true with such trees as box elder, sumach, willow, ash?

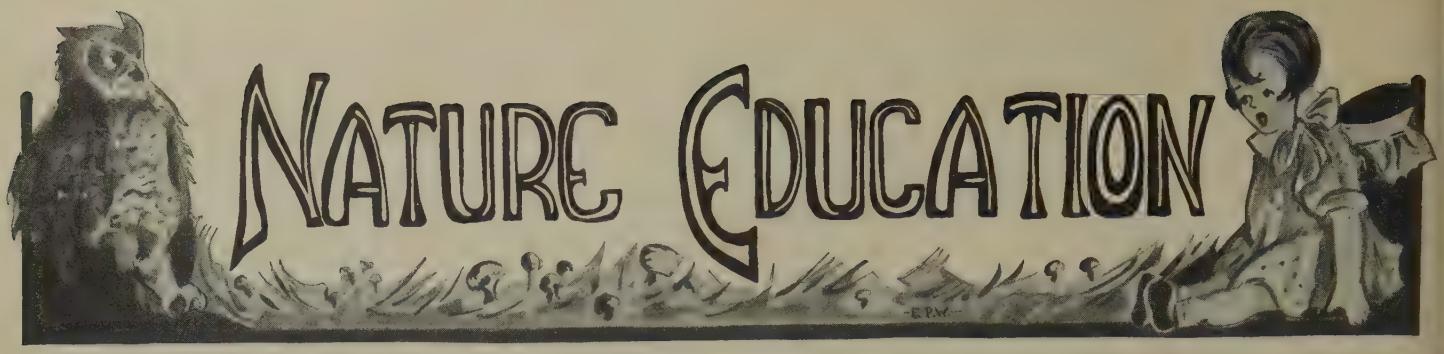
Young woodchucks and marmots and their kin may begin to show themselves at the entrance to their burrows in June. Not infrequently many of them may be so tame that they do not scurry away at the first sign of danger, or they may wander away from the den in search of something or other and become lost. If you are fortunate enough to find one of these, as I do nearly every year, you may have some fun with it for a pet. Your greatest difficulty may be in connection with feeding the little creature, because of the fact that it may not have become completely weaned. You will be able soon to interpret some of the calls of your pet and determine what means satisfaction, what means excitement and a number of other things. See how many different reliable interpretations you may make. Are young woodchucks sanitary in that they keep their nest clean or are they not? Are all animals the same in this respect so far as you can find out for yourself?

Bees and other insects will be busily visiting various flowers in search of nectar during June as well as during other months. The idea has been advanced that flowers are variously colored for the purpose of attracting particular insects. Watch a bed of varied colored flowers and see if a certain insect visits only a certain colored flower. It is interesting to note that apparently insects are color blind so far as we see colors, though physicists tell us that they respond definitely to certain colors which do not differentiate themselves to us. Remember that, while an insect may be visiting red and blue flowers so far as you are concerned, it may be visiting flowers of but one color so far as it is concerned.

The parental care exhibited by birds and mammals during June may be duplicated in the same month by certain fishes. The little sunfish that anyone can catch who can fish at all may be building its nest during this month. The nest is built by the male, who clears away a space among the weeds or material on the bottom of the pond. Into this space he induces a female to come. The fertilized eggs hatch and the young may be watched over jealously by the male, who will not hesitate to attack any intruder, whether it be another fish or a stick which you may thrust in his way. With some of the basses like the black bass, the nest is guarded by both of the parent fishes until the young are able to shift for themselves. Where the open season for these fishes begins before the breeding season closes whole families of bass may be wiped out as the result of the parental care shown by the parent fishes. If you have the opportunity of observing a sunfish nest, notice what, if any, peculiar courtship antics are performed by the male. It must not be assumed from the above that young fishes are never cared for by the female alone. Later in the season I may call a case to your attention where the female assumes the responsibility.

LIVES OF NATURALISTS

Who were the men who blazed the trail in science and Nature knowledge? Who were those that caught up the banners of the pioneers and carried them forward? Their lives were full of romance, adventure, discouragement, rebuffs, public indifference and even antagonism. Most of these men fought almost insurmountable obstacles in the cause of knowledge. Their lives are an inspiration. Their stories are remarkable. Beginning with the July issue of NATURE MAGAZINE, *a brief biography, attractively written, will appear each month. It is a fine series, contributed by men who knew these leaders or who are authorities upon their lives*



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Camp Leadership Course More than a million boys and girls are to be in camps of various sorts this summer. In preparation the Camp Leadership Course given by Teachers' College at Briarcliffe Manor, N. Y., during Easter week, was well attended by persons interested in all phases of camp work. Among the instructors in Nature Study were W. G. Vinal of New York State College of Forestry and E. L. Palmer of Cornell University and NATURE MAGAZINE.

* * *

Nature Study Institute The annual Teachers' Institute, Washington, D. C., held April 15, was devoted to Nature Study, the speaker being E. Lawrence Palmer of Cornell University. Dr. Palmer emphasized the fact that in the time it takes to learn of exotic creatures and to fix in mind superstitions and fallacies, a child may learn with infinitely greater profit the phenomena of his environment, and the truths concerning them. "Aphids are nearer neighbors than alligators, even if less apt to be mentioned in alphabet jingles, and bats do not desire to get into one's hair, though even baldheads fear their doing so," said Dr. Palmer. The speaker stressed the importance of preserving the child's viewpoint in teaching Nature Study, and of providing for individual differences of interest and outlook.

* * *

Growing Trees from Seed At this season many schools and organizations may desire specific and practical information on tree planting, such as is contained in a brief bulletin by Fay Welch entitled "Growing Trees from Seed." The bulletin is issued by the coordinating Council on Nature Activities, and can be ordered from the Comstock Publishing Company at a cost of five cents.

* * *

A Good Combination Natute study and health study are combined by Mrs. Leta Connor, teacher in the public schools of Fredonia, Kansas. Mrs. Connor first taught Nature Study in the schools of her town. Then the superintendent asked her to take over the supervision of health work in the schools. Among the health activities which she has introduced into the schools is Nature study hiking. Nature study hiking combines all the elements of good recreation, fresh air, sunshine, mild exercise, and an interesting objective. Mrs. Connor says that she finds it a good combination. Certainly it is a combination which any teacher might make.

American Forest Week Observed American Forest Week was observed by nature classes of the Washington public schools in a series of assemblies at each of which a Forest Service film, "Trees of Righteousness," was shown. The picture told a vivid story of forest destruction by fire. Among the speakers were Assistant Secretary of Agriculture W. R. Dunlap, Col. Wm. B. Greeley, Chief of the U. S. Forest Service, Representative Scott Leavitt of Montana, Mr. W. C. Barnes, Mr. J. B. Cuno, and Mrs. L. T. Conway, all of the Forest Service.

* * *

Boy Scout Rally In the arena of the Riding and Hunt Club, Washington, D. C., on the night of March 20, Boy Scouts gave a demonstration of camping, life-saving, bridge and tower building, cross-cut sawing, chopping, organized games, physical drill, and a pageant illustrating the origins of scouting. Two types of bridges—truss and pontoon—and a forest fire lookout tower were built with poles and rope lashings, not a spike or nail being used. It was a real demonstration of the type of work Scouts can do in summer camps, and showed the possibilities for other types of outdoor work.

* * *

The Outdoor Code "Help save the trees and wildflowers. Protect the birds and game. Keep the highways beautiful. Pick up the picnic rubbish. Put out your fire, then bury it." Posters 9" x 12" bearing this message may be had of the Wildflower Preservation Society, Inc., Washington, D. C., two for five cents, or two dollars per hundred.

* * *

Bird Classes for Schools Two hundred boys and girls of the Nature Study classes of the public schools of Washington, D. C., have attended during March five classes in bird study, especially arranged and conducted by the Audubon Society of the District of Columbia in a centrally located school building on Monday afternoons from three-thirty to four-thirty. Youngsters showing special interest and aptitude for bird study are to be given opportunity to participate in the field meetings of the society. This work, which has been carried on in cooperation with the Nature Study work of the schools each spring for a number of years, is felt both by school officials and Audubon members to be of great value to young Nature lovers.

A Nature Puzzle

By Louise R. Peattie

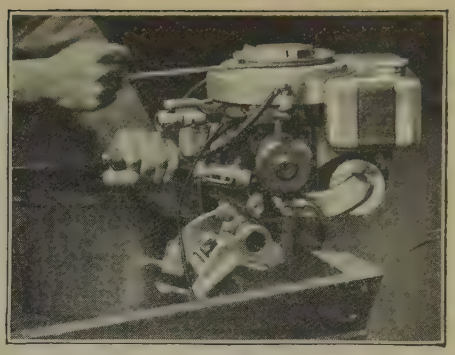
In this puzzle a slogan of fifteen letters is concealed, one letter hidden in each line, and the whole suggested in the last line. For example, to take the first line, s is in "moccasin." Now see if you can finish the enigma! Most of the flowers here mentioned, by the way, are the ones in direct need of protection.

My first in Indian moccasin lies,
My second in gentian and botanize,
My third is in violet, not in laurel,
My fourth is in flower but not in floral.

My first is in wild but not in garden,
My second's in picking, but not in pardon,
My third is in trillium as well as in lily,
My fourth is in dogwood that's treated so illy,
My fifth is in saxifrage, not in bloodroot,
My sixth is in lotus, not down-in-the-mud root,
My seventh is in rhododendron and rose,
My eighth's in mayflower that bashfully grows,
My ninth's not in holly, but in the ground pine,
My tenth is in bittersweet, not columbine,
My last's not in root, but it is in seed,
And my whole is a slogan we all should heed.

The answer to this puzzle will be printed in the July issue.

May Answer
PROTECTION



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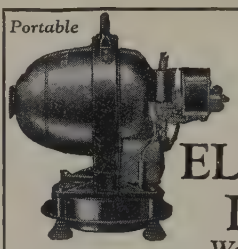

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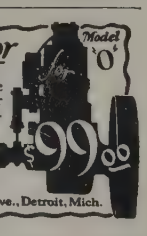

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Mammalogists Meet

The eighth stated meeting of the American Society of Mammalogists, whose membership includes several men and women associated with NATURE MAGAZINE, took place in the rooms of the American Museum of Natural History, New York City, April 27 to 30, 1926.

The principal features of the first day's session consisted of a tour through a large establishment at Newark, New Jersey, where many of the processes employed in the conversion of raw furs into garments were demonstrated, and a good idea gained of the manufacturing methods of this immense industry. In the evening the board of directors met at the Explorer's Club.

On April 27 the first of the regular forenoon and afternoon sessions, devoted to the reading and discussion of papers, was held at the museum, and this program was continued through the two days following. These discourses covered a wide range of subjects, from short papers reporting the finding of the fossil remains of some rare mammal in a new locality, or observation on the food habits of a well-known species, to learned treatises on some morphological or anatomical studies embodying the results of many months of work. Papers of more than ordinary popular interest included an illustrated talk on the Lemmings of Lapland, featuring their migratory habits; early figures of American mammals, showing reproductions of prehistoric and early modern attempts to illustrate some of our species; hibernation of some of our small mammals; big game and predatory animals of the subarctics of Canada; the introduction of game and fur-bearing animals from state to state; and personal recollection of some old-time trappers. These papers, and many others of great interest, gave rise to considerable discussion.

One afternoon was devoted to a symposium on Furs and Fur-bearing Animals, and the great extent of the business of collecting and preparing the skins of mammals was well brought out. The trade in peltries, formerly derived mainly from the boreal regions of the earth, now reaches the uttermost parts of the temperate and tropical zones, and affects many groups of mammals formerly not considered in this light. In the discussion which followed, the necessity of curbing the demand for certain kinds of fur, if

many of our species are to be preserved from virtual extinction, was brought out.

Two notable evening entertainments, illustrated by motion pictures of great excellence, were given in the auditorium of the American Museum. Trailing wild animals in Africa, exhibiting the series of surpassing motion pictures of elephants, zebras, gazelles, giraffes, and many other species taken by Martin Johnson, afforded an example of the possibilities of photographic work when conducted by an expert in an unspoiled region, and unaccompanied by any shooting or other disturbing influences. The sight of these timid beasts, seemingly within a few feet of the observer, moving about, feeding, drinking, and pursuing their accustomed habits, plainly oblivious of the photographers, is a treat that will linger long in the memories of the fortunate audience and should help to delay the day when these notable species will be seen no more. The true north, depicting the travels of a pair of bow-and-arrow-bearing sportsmen in Alaska, was also very interesting. While somewhat marred by the rendering of incidents of travel which gave plain evidence of being stunts rather than methods dictated by necessity, the film nevertheless included some really excellent pictures of moose, mountain sheep, and brown bears, which after being photographed seemed to deserve a better fate than to be transfixed by the arrows of even such doughty bowman.

A very interesting visit to the New York Zoological Park, where the members of the society were the luncheon guests of the Zoological Society, and later viewed the living animals and birds, and the incomparable paintings and collection of heads and horns, under the guidance of the officers of that institution, brought to a close this very notable meeting.

For Nature Guides

There was a waiting list for the Nature Guide School run under the auspices of the National Park Service at Yosemite National Park last year, and indications are that the twenty places as students will be equally in demand this year. With a wonderful laboratory in which to work, competent instructors, minimum cost and the expanding field of Nature guide work, the school offers a fascinating experience. Applications will be accepted in order of their mailing, and all information can be obtained from Park Naturalist, Yosemite National Park, Yosemite, California.

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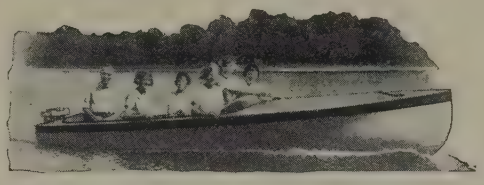

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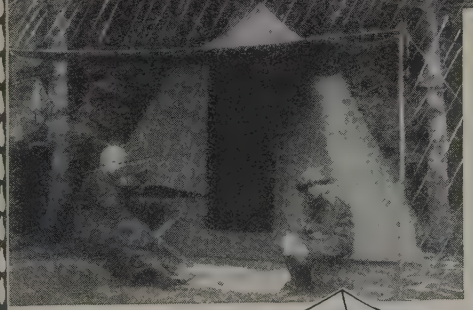

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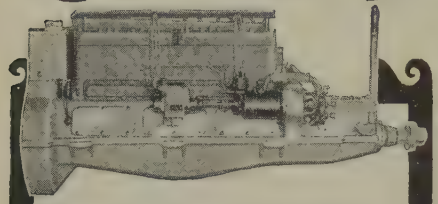

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Which Hawk

In the April issue on the Amateur Nature Photographer's Page there was printed a picture labeled the Red-Tailed Hawk, submitted by W. T. Wakefield, of Bentley, N. D. Mr. George Miksch Sutton, State Ornithologist of Pennsylvania and noted bird artist, differs with this identification and feels that the picture is of the larger Ferruginous Roughleg Hawk. We quote a paragraph from Mr. Sutton's letter which is an interesting example of methods of identification:

"In identifying a black and white half-tone of this kind, the bird-artist has a decided advantage, for the artist, in studying poses and facial expressions of his subjects, learns to depend upon the general bearing and 'looks' of the bird rather than upon details of color-pattern. In the present photograph the comparative length of bill and gape, the position, shade, size and expression of the eye, and the contour lines of the head and neck are clearly not those of the Red-tail, but of the larger Ferruginous Rough-leg. It is true that the tarsus of the foot does not show the feather-covering clearly; but the color-pattern of the breast and belly is clearly that of the Ferruginous Rough-leg and not of the Red-tail. The belly and flank feathers of the Red-tail always show some transverse barring. Furthermore, the color-pattern of the head in the present photograph does not show the dark malar stripe of the Red-tail, nor does it show the characteristic broken bar of brown across the breast and lower throat."

Kentucky's Bird

Within a space of sixty days the Legislature of Kentucky created by law a state bird, a state flower and a poet laureate who could mould his verses to do them credit. You are quite right, the bird is none other than the Kentucky Cardinal. The flower selected is the goldenrod, and the responsibility of doing justice to Kentucky in iambic pentameters and the like rests upon Dr. J. C. T. Noe, of the University of Kentucky.

Fire-flies

Under this title in the May issue we published a note and six delightful lines of verse. The original author of these lines is Elizabeth Modox Robert, who included them in her book of poems called "Under the Tree," published in 1922 by B. W. Huebsch.

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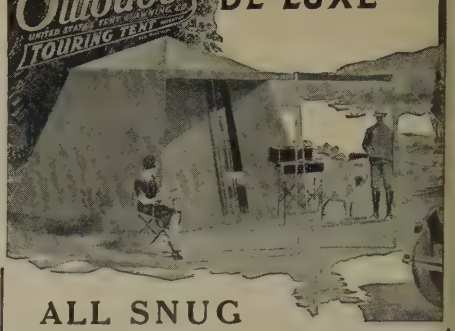

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Reptile Study Society

Having for its purpose the study of herpetology, and also the protection of harmless reptiles for humane and economic reasons through legislation, books and articles, the Herpetological Society of California has been organized in Los Angeles. The officers are: Dr. G. Edward Roehrig, president; Dr. Charles Lincoln Edwards and Mr. Alfred Cookman, vice-presidents; Miss Sarah R. Atsatt, recording secretary; Mr. Frederick S. Webster, corresponding secretary; Mr. Albert E. Colburn, treasurer. For the information of those of our readers who live in or near Los Angeles or may be visiting there, we may say that the society will meet in the evening of the first Thursday of each month at 715 South Bonnie Brae, Los Angeles. This is also its mail address.

Girl Scout Camp

An active season resulting from the steady growth in the work is anticipated by national headquarters of the Girl Scouts, Inc., at their national training school for Girl Scout leaders at Briarcliff Manor, New York. The season at the camp, which is under the direction of Jane Deeter Rippin, opened on May 17 and will continue until October 15. Effective and constructive courses have been mapped out with experienced instructors in charge. The Nature and forestry courses are under the conduct of Dr. Bertha Chapman Cady and play an important part in the work. All the details about the courses and the camp may be obtained from the headquarters at 670 Lexington Avenue, New York City.

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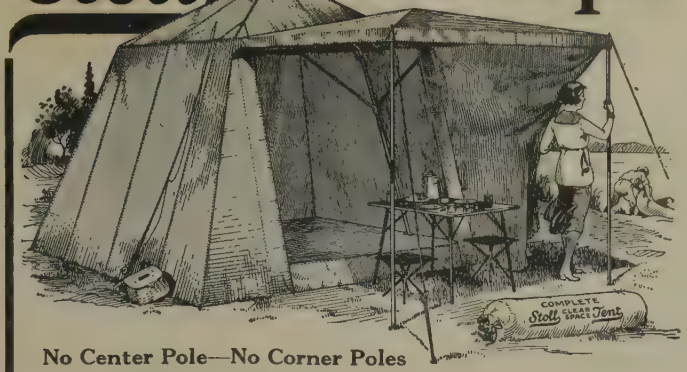

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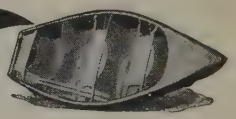

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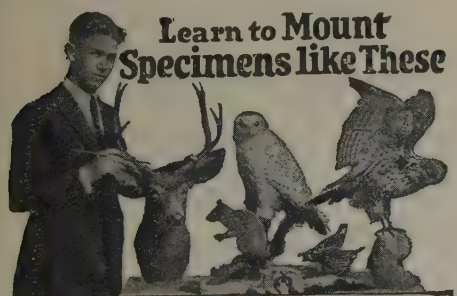

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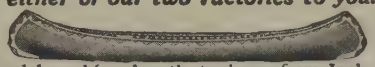

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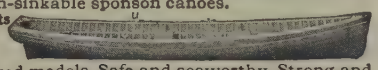

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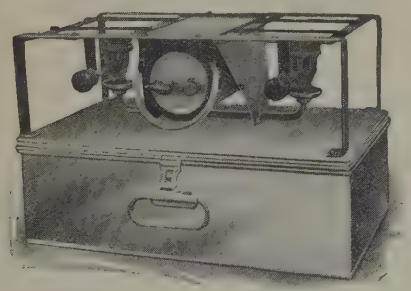

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Questions and Answers

The American Nature Association will be glad to answer each month such questions as its members ask about Nature.

QUESTION: *What is the range of the Western Tanager?*—G. S. D.

ANSWER: The range is British Columbia and northern Alberta to Mexico and the eastern base of the Rockies and the Black Hills to the Pacific coast. It has been found on a few occasions eastward to the Atlantic coast.

QUESTION: *How old does a mud turtle become and how large is it before it lays eggs?*—H. C.

ANSWER: The age reached by mud turtles is not known but they are probably several years old before they lay eggs. They are very slow-growing creatures and the common species would then probably be about four inches long, depending upon food and living conditions.

QUESTION: *Can you tell me what kind of a bird the thunderpump is; whether the Cardinal and Redbird are the same; whether the windflower is a small flower that grows by the road; whether the silver top is somewhat like the goldenrod; and where is the adder tongue found?*—M. S. J.

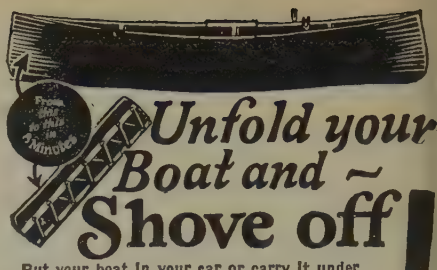
ANSWER: (Please sign your full name to inquiries.) The bird known as the thunderpump is the American bittern. The Cardinal and the Redbird are the same and the bird builds its own nest, usually in bushes. The windflower is an anemone, some varieties growing along wooded roads. We are not clear whether you refer to the silver rod or the pearly everlasting when you say "silvertop." There are a number of plants called adder's tongue but possibly you refer to the so-called dogtooth violet, which is really a lily and is found in moist, woodsy places rather early in the spring.

QUESTION: *Is there such an animal as the sea dog?*—H. W.

ANSWER: The common harbor seal, *Phoca vitulina*, is sometimes called sea dog.

QUESTION: *Can you tell me of the formation of the crest of the California quail?*—H. L.

ANSWER: The crest of the California quail consists of several feathers with recurved edges. These fit successively into each other so that the crest when closed may appear to be one feather. The female is also crested, but the crest feathers are shorter than those of the male.



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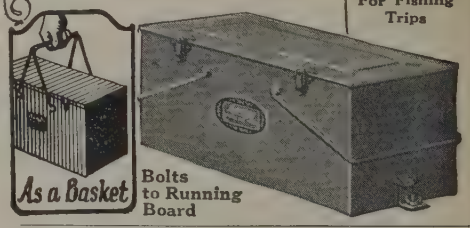

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Readers' Service Department

We have frequent requests from members and readers for sources of various materials and things of Nature. It is in view of this that this column is made available

Some Seeds Wanted

Miss Lurana Van Doren, of 723 Eighth Street N.E., Washington, D. C., wishes to obtain some seeds of the Blue-eyed Mary.

* * *

Insects and Plants

Lowell Woodbury of St. George, Utah, is particularly interested in insects and plants and would like to get in touch with others for the purpose of exchanging specimens in both of these fields.

* * *

Who Has Turtles?

Harold G. Heckendorf who lives at 1909 Winnebago Street, Madison, Wisconsin, would like to purchase some turtles of various species.

* * *

One Coyote Pup

If there is anyone not too distant who has a coyote pup they would like to dispose of, Dick Wood, Jr., of McComb, Mississippi, would like very much to have such a pet.

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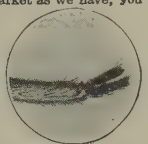

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The Tree Planting Army

THOUSANDS of semi-centennial trees were planted this spring and reported to the American Tree Association. One of the largest enrollments, 150, came from New Rochelle, New York, where Katherine Dolbear of the Nature Study Department of the schools directed the work. The year 1926 marks fifty years of forestry activity by the Government.

* * *

The first centennial tree reported to the American Tree Association is enrolled by J. E. Scallan of Iowa, who now plants a sesqui-centennial tree and joins the tree-planting army. The centennial tree was planted in 1876 by his father. Who knows of other centennial tree plantings?

* * *

One of the latest requests for information as to the work of the American Tree Association comes from New South Wales, where W. Benson makes the inquiry. He also wants the town forest information.

* * *

L. C. Day of Baldwinville, Mass., has just been enrolled in the tree-planting army, having set out several thousand trees.

* * *

T. C. Luther, the "champion tree planter," informs the tree-planting army that he plans to set out one million more trees just to mark the sixty-third anniversary of his birth.

* * *

Through the extension department of the college of agriculture in Tennessee, Glenn McClellan, the demonstration agent for Roane County, is sending the association's tree-planting message through the clubs there.

* * *

Aiding the Arbor Day program, Erie Boy Scouts planted 15,000 trees between Erie and Waterford. Herbert Spencer, head of the local troop, was in charge of the tree planting with Harry E. Frayer, Scout Executive.

* * *

John L. Russell, assistant superintendent of parks, of Denver, planted a Cedar of Lebanon on the state capitol grounds. The tree takes its place beside three others of the same kind.

* * *

The Jeff Feigl Post of the American Legion dedicated an oak tree in the Grove of States in Riverside Park, New York City, in memory of Lieut. Jeff Feigl, first American artillery officer killed in action overseas.

* * *

Boy Scouts, of Averill Park, started this week to reforest several acres of ground near Troy, New York. The boys, with the cooperation of the New York State Forestry Association, planted 10,000 evergreen trees.

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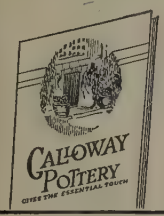

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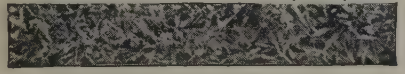

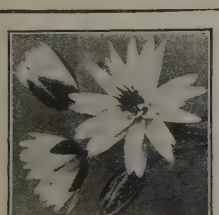

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Memorial trees were planted at Rome, Georgia, in honor of Judge Moses Wright. The trees are the gift of the Rome Woman's Clubs, the Georgia Federation and the National Federation of Women's Clubs and have been planted in a semicircle. The program was in charge of Mrs. J. H. Reynolds.

* * *

A hundred-tree apple orchard was planted in Thatcher Woods of the Cook County forest reserve in memory of "Johnny Appleseed" and his sesqui-centennial anniversary. Members of thirty-two Chicago organizations and thousands of school children took part. The University of Chicago, University of Illinois and the Chicago Historical Society were represented. Anton J. Cermak, president of the county board, accepted the Memorial Orchard on behalf of Cook County. Jens Jensen was the chairman. "Johnny Appleseed" was John Chapman. He was born in Boston in 1775.

* * *

In Mississippi, Mrs. G. H. Reeves, of the Federation of Women's Clubs, has a tree-planting campaign by clubs under way in cooperation with the American Tree Association. Mr. Reeves has just been appointed a member of the State Forestry Commission by Governor Whitfield. She was also state chairman for American Forest Week.

* * *

John R. McQuigg, National Commander of the American Legion, when told the Department of California had taken up as one of its major activities the conservation of the natural resources of the state, said: "The conservation of the natural resources of our nation has become imperative. I know of no greater work that the Legion can do than devote its efforts along these lines. It is my belief that many of the departments throughout the nation will soon be undertaking similar work." At a special meeting of Towanda, Pennsylvania, Post No. 42 of the American Legion, a resolution was adopted pointing out the need for conservation along many lines, and, in particular, the imperative need for the protection of our nation's forests and the reforestation of our waste lands. This resolution, signed by H. W. Acla, Post Adjutant, is to be submitted to the next Department Convention and, if there approved, to be submitted to the next National Convention, as Carl Fanning, of the post, informs the American Tree Association. The Legion posts have taken part in thousands of tree plantings and the Town Forest idea has been put before many of them.

* * *

Girl Scouts have planted 18,000 trees at Camp Andree, the National Girl Scout camp at Briarcliff, New York. Much of the reforestation has been done with conifers, a species of evergreen. At Camp Andree, 16,000 of the trees planted were evergreens, red spruce, white spruce, Norway spruce, white pine and hemlock, and they ranged from seedlings to trees of several years' growth. Broadleaf trees and shrubs were used to decorate the grounds. The American Tree Association has sent Forestry Primers to all training camp headquarters.

* * *

A demonstration forest of approximately 17,000 trees will be planted by Joseph D. Baker on sixteen acres of land in the Catoctin Mountains, Braddock Heights, Frederick, Maryland.

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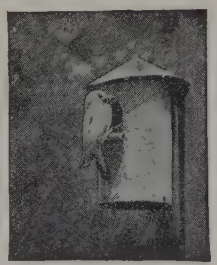

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Dr. J. A. C. Chandler, president of the College of William and Mary, planted a live oak tree in the section of the city named in his honor, "Chandler Court," which was commenced several years ago by Dr. John Garland Pollard.

* * *

A Hoo-Hoo forest was planted in Lansing, Michigan, the home of Snark A. J. Hager, as one of the features of American Forest Week. The forest is in the shape of a wheel, whose hub, spokes and rim will typify the purpose of the club, and the official personnel of the order.

* * *

Boy Scouts, of Jackson, Michigan, are going into the Christmas Tree business. This is a part of the ten-year program of reforestation work recently adopted by the Jackson Council and announced by George Hunt, chairman of the camping committee. One thousand two-year-old Norway spruce have been purchased and set out this spring. The trees will be ready for Christmas sale in seven years.

* * *

Four holly trees, twelve feet high, have been added to the setting for the Municipal Christmas Tree of Kansas City. S. G. Warver, general passenger agent of the Kansas City Southern, presented the trees to the city.

* * *

Marking the fraternity of the press of North and South America a tree was planted on the grounds of the Pan American Union in Washington during the First Congress of Journalists representing twenty-one American republics.

* * *

Ceremonies, at the planting of 150 elm trees on the grounds of the James Whitcomb Riley hospital for children in Indianapolis, were directed by the Caroline Scott Harrison Chapter, D. A. R. Mrs. James Gavin, regent of the chapter, presided. Mrs. James A. Taylor, chairman of the committee on "conservation of trees," spoke. Miss Catherine Dreson was in charge of the ritual and Henry A. Raymond read an original poem.

* * *

A party of twenty-four selected Boy Scouts in Hartford Council are to cooperate with the state forestry department in planting trees at the Mohawk State Park, near East Cornwall, Connecticut, during school vacation. Austin F. Hawes, State Forester, had three men supervise the planting. E. L. Machol, assistant scout executive, was in charge.

* * *

The Oswego Kiwanis Club will develop a miniature forest somewhere along the Lakeshore within easy driving distance of Oswego. Following an address by Prof. J. A. Cope, of the forestry department of Cornell University, the club authorized Fred B. Morris, chairman of its agricultural committee, to negotiate for the purpose of a suitable ground.

* * *

Fifteen Memorial Trees were planted at "Kenmore," Fredericksburg, Virginia, in honor of citizens of Colonial days. On the honor list was George Washington, Mary Ball Washington, Betty Washington Lewis and Colonel Fielding Lewis. S. Otis Bland made the address.

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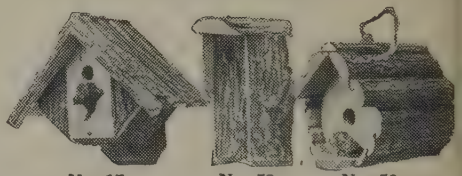

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(*Gen.* indicates a general article; *illus.*, a photograph or drawing; *rev.*, a review)

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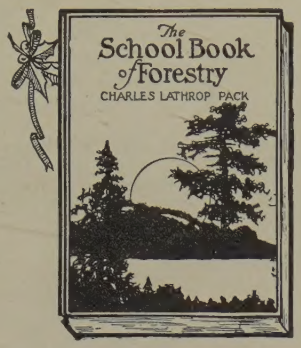

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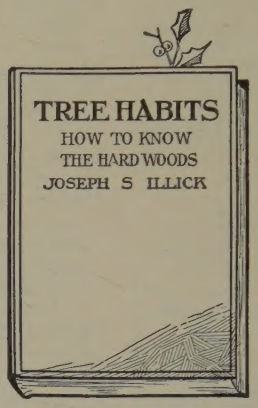

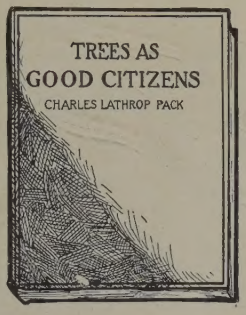

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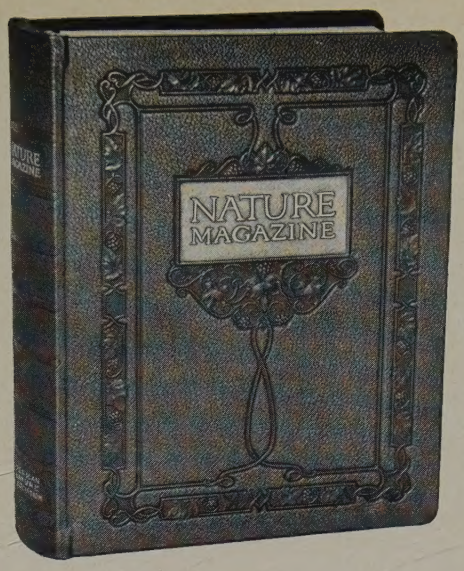

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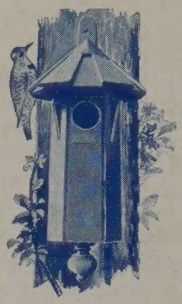

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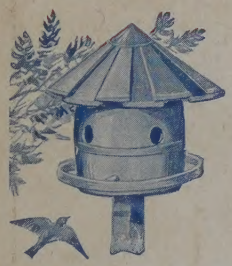

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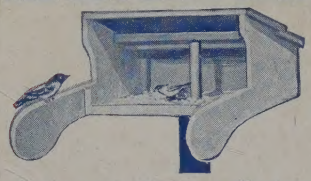


Automatic Feeding Shelter

Stocked with a few simple foods they crave and Dodson's Suet Cake and Grain Mixture, lures Songsters from the whole neighborhood. Automatically revolves to protect birds from storms. Cypress finished in white and green. Sizes 24x22 x 12 in. including 8-ft. pole, $8.50.

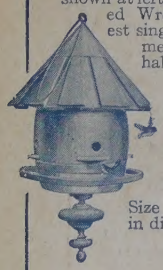
Why Dodson Houses Win the Birds

Mr. Dodson has for many years devoted his entire time to lecturing, visiting beautiful estates in the study of wild birds all over America. Many seemingly insignificant details have been discovered and patented by him that are vital in the luring of Songbirds to man-made houses. Mr. Dodson is always willing to talk before clubs or associations interested in creating bird sanctuaries, either private or municipal.

Dodson's Suet Cake, 40c a pound; Grain Mixtures, 10c a pound. Manchurian sunflower seeds, 25c a pound.

Dodson's Scientific Wren House

shown at left wins the Silver Throated Wren, one of our sweetest singers. A four-compartment house satisfies their habit of changing nests for each of their three broods. Beautiful design, made of oak, finished in green with cypress shingles, copper coping; comes complete with rust-proof snap on hanger. Size 28 in. high by 18 in. in diameter. Price, $7.00.



Bird Bath

This handsome stoneware bath is not only an ornament to any garden but is the only one where knowledge of the birds' habits, fears and preferences have been considered in designing a bath that the birds enjoy and use. Complete with 32 in. stand. Price, $26.00. Write for our big catalog of art stoneware furniture.

FREE

"Your Bird Friends and How to Win Them." My fascinating book sent to anyone who loves our beautiful Songbirds. It is full of things you should know. Based on 40 years' study of this interesting subject.

CARDINAL BIRD

Will haunt your Automatic Feeding Shelter

Protect the Songbirds from marauders. Dodson's Guaranteed Sparrow Trap rids your premises of these pests.

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Mr. Dodson is President of the American Audubon Association

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